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VIEWS, NEWS AND INTERVIEWS.

According to statistics compiled by Clarence Deming, Connecticut was an attractive field for electric railway enterprises for several years. The greatest distance between adjoining cities is 23 miles, in the case of Danbury and Norwalk, while Norwalk and South Norwalk, as well as Ansonia and Derby, are physically united. A population of more than 200,000 fringes the shore of Long Island Sound for about 45 miles, between Greenwich and New Haven, and along the 36 miles from New Haven to Hartford there is a population almost as large. Although out of 168 townships in the State 135 are intersected by one or more steam railways, there were so many attractive openings for electric roads that the trolley car was soon such a familiar sight in the land of wooden nutmegs that the steam roads became alarmed and commenced an open war, and have, on different occasions, opposed them.

Telephones are to be admitted into Italian nunneries by a recent decision of the congregation of bishops, but a strict censorship will be exercised over the wires.

One of the most extensive projects ever contemplated in connection with Sacramento, Cal., is now said to be under serious consideration by capitalists, and with very encouraging prospects of a result in the planting there of one of the most important manufacturing industries on the coast. The plan proposes the operation in Sacramento of one of the largest iron plants west of Ohio, for smelting by electricity ores from mines which have recently been located at a point within easy communication with Sacramento.

"The Annex," a new ferry-boat which will run between the Pennsylvania Railroad station at Jersey City and Fulton street, Brooklyn, N. Y., had her trial trip last week. She is equipped with all the modern appliances and is illuminated throughout by electricity. She is to be provided with a powerful search-light, which will be used at night in revealing the different objects of interest along the harbor to her passengers as well as an aid to navigation.

Mr. H. H. Kohlsaat, owner of the Chicago *Times-Herald*, is the first man to make practical use of the telautograph for newspaper work. In a recent issue of that paper eight messages from citizens and statesmen attending the Cleveland convention were printed in *fac-simile*.

Wants To Be an Electrical Engineer.

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you kindly inform me the best way in which I could learn electrical engineering, or name some firm where I could learn it? I am a clerk in the Prudential Insurance Company, home office, and am 20 years of age. I have had some experience in bell work, but would like to take engineering. If you could give me any information you would confer a great favor upon,

Yours very truly,

E. L. W.

Newark, N. J., Sept. 3, 1895.

Cost of Steam Power for a Central Station.

TO THE EDITOR OF ELECTRICAL REVIEW:

The Rome, Ga., Electric Light Company buys steam power from the city electric railway to run its arc and incandescent dynamos. How much per horse-power ought we to pay for a 12-hour run, say from 5 P. M. to 5 A. M.?

We have a small machine which is run by the same engine that runs the railway generator, which furnishes light and power from 6 A. M. to 6 P. M. How much ought we to pay for that?

Thanking you in advance for the information which, no doubt, you can readily give, I am,

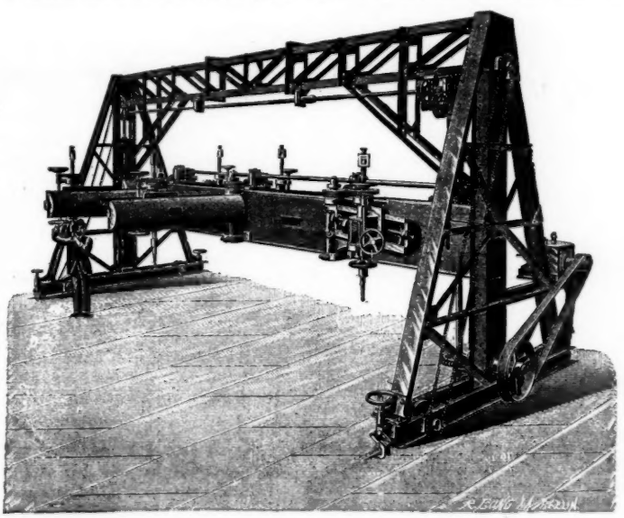
Yours very truly,

J. KING, Secretary.

Rome, Ga., September 7.

[If the railway company cares for your dynamos while running we think that charges based on $5,000 per year for 100 horse-power would be fair. The charge for the smaller machine would be in the same proportion. —ED.]

The Butte, Mont., Mutual Telephone Company, capital $200,000, has been organized.



SEXTUPLE ELECTRIC DRILLING MACHINE.

Sextuple Electric Radial Drilling Machine.

The illustration on this page, for which we are indebted to the *American Machinist*, shows a drilling machine lately built by Habersang & Zinzen, of Dusseldorf, for an establishment in South Germany. It is interesting for its size and for the large area commanded by it. The frame of the machine is composed of two latticed uprights bound by a strong girder and standing 10 meters (32 feet 9 inches) apart. A cross-beam extending between the two uprights has a vertical travel of two meters (six feet six and one-half inches). This beam carries on each side of it three arms, each two meters (six feet six and one-half inches) long, similar to the arm of a radial drill, and carrying a form of the customary radial drilling mechanism. The total area covered by the machine is said to be $10 \times 4 = 40$ square meters (430 square feet), but this is evidently to be discounted somewhat, as there can be no drilling under the cross-beam, and, as the several radial arms are not movable on the beam, the area covered by them is that of three semi-circles on each side, more or less overlapping each other, instead of a rectangle of the dimensions given. The entire machine, however, is mounted upon rails and is movable thereupon by its own power, so that the surface covered is determined only by the length of available rail. An eight horse-power electric motor is fixed upon the gear box attached to the cross-beam. From this motor power is transmitted by suitable shafts and gearing to move the whole apparatus along the rails, to raise and lower the cross-beam, or to operate each individual drill. The extremity of the base of each upright is provided with a clamp to secure it to the rails, so that when in use any pressure applied to the drills will not displace the machine.

The price of steel rails advanced last Wednesday $4 to $28 per ton, the advance to take effect at once.

ELECTRICITY AS THE MEDIUM OF TRANSMISSION IN THE BRAIN.

BY S. MILLINGTON MILLER, M. D., IN THE "NEW SCIENCE REVIEW."

The brain of highly intelligent adults consists of an enormous number of cells of different shapes and sizes, connected with one another and with the "end-plates" in the muscles by an equally enormous number of fibers. The gray matter cells occupy the entire substance of the cortex of the cerebrum, and the white substance of its body is entirely composed of connecting fibers. A microscopical view of this cerebral body gives one very much the impression of a marvelously equipped and powerful dynamo—numerous and confusing bunches of wires, or fibers. These fibers not only connect the various centers of sense in the occipital cortex with the centers of motion under and around the fissure of Rolando, and join these motor centers with the "end-plates" in the various muscles of the body, but there are also a very great number of other commissures connecting the sense and motor centers in the occipital cortex with those higher centers in the frontal cortex in which the finer processes of speech and mentality are now supposed to reside.

If there were one large cell where impressions of sight were received and modified, and one where they were acted upon by that process which we call thought, it would be far more necessary to predicate the existence of some entirely ultra-physical form of energy in that center which was able to elaborate impressions of sense into conclusions of thought. But a diametrically opposite condition of affair is present. Thousands and thousands of rods and cones exist in the retina of the eye. An equal number of multipolar cells in the floor of the retina modify the vibrations of sight so that they may proceed to the center of vision in the cortex of the cerebrum. In this center thousands of multipolar cells, each connected with a separate cell in the retina on one side, and with a separate cell in the frontal cortex and the motor centers on other sides, change by some as yet unknown process impressions of sight into thought, volition, memory, muscular action.

This same truth holds in regard to the manner in which other impressions of sense are received, conveyed, and elaborated. The argument from analogy is, therefore, so strong as to be well nigh conclusive that there is some connection between the great number of centers in which sensation and thought are received and elaborated, and the great number of sights and sounds and tastes and smells which travel momentarily up into the brain through the portals of sense.

The higher centers of will, or those from which the orders come which cause muscular movement resulting in actions, or in speech, are cut off by hypnotism and in sleep from their conscious connection with the centers of sensation, and may be formed by the volition of an entirely distinct individual. This alien volition reaches them as an electrical current sent through the fibers of the auditory nerve. Or the pole of a battery applied to them will not only cause movement of the coarser muscles, but also give rise to vibrations of the vocal chords, producing what is known as speech. This entire line of *thought* would indicate that that form of molecular motion and interaction—which we designate by electricity—is at the root of every function of the brain, and the fact that the infinite complexity of action in many cases clouds our understanding of the *modus operandi* is no reason why we should not struggle to follow the clue to its legitimate goal, rather than call into service a spiritual something whose method of procedure is entirely outside of the sphere of either sensation or thought.

A book lies upon a table. The waves of ether dash its shape upon the image field of the retina, whose nerve cells change light into electricity, and transmit the sensation in the direction of least resistance—which means by one particular fiber to one particular sense-center cell. At this particular sense-center another transformation of energy takes place, which (further modified, perhaps, by a motor-center) sends out an order to the muscles of the hand to lift and open the book. It will be noticed that just one series of fibers and centers is employed in this act, and that what these centers accomplish is nothing more complex than a transformation of one form of energy into another—in one particular way—the habit of which has been forming ever since infancy. In other words, this particular chain of consequences is imperative, for it has been forged by imitation and it has been linked by an infinite number of repetitions of the same action.

But there are higher functions involved. A certain fiber or set of fibers connects the center where the sensation is received with a center, or centers, of speech in the frontal convolutions, and these "speech-centers" are connected by fibers with the muscles of the vocal chords. It is quite within the range of conjecture that each vowel and consonant and word sound have specific nerve cells as their storehouse. And electrical movements proceeding from the cell, or cells, of sense by the way of least resistance, which is the old-established channel, reach certain frontal cells and are reconverted into new forms of motion, producing a certain movement of the vocal chord which gives rise to the sound "book."

This whole series again is, in a certain way, just as simple as the original "seeing, lifting and opening" process. It has been acquired by imitation, and has become fixed by habit, and the sound "book" is just as certain to be thrown up as are the corresponding letters to be printed by the proper fingering of the typewriting machine. It should be remembered in this connection that we hear the word book in the brain when we see a book, although we may not articulate the sound.

The great difficulty experienced in writing on this subject, or, what comes before writing, in thinking on this subject, is in itself the strongest kind of proof of the truth of my explanation. Channels opened up by imitation and beaten by habit are such easy pathways of thought that the action is sometimes unconsciously performed. But where the journey of the thought wave is made for the first time, it has to build its own channel, and meet all kinds of obstacles in the way.

THE TELEGRAPHERS' REUNION.

ANNUAL MEETINGS OF THE OLD TIME TELEGRAPHERS' ASSOCIATION AND THE SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS HELD IN NEW YORK LAST WEEK — PRESIDENT COCKEY'S ADDRESS TO THE OLD TIMERS—NEXT MEETING TO BE HELD AT PITTSBURGH—S. A. DUNCAN THE NEW PRESIDENT—GENERAL ECKERT PRESENT AT THE MILITARY TELEGRAPHERS' MEETING—PRESIDENT PLUM RE-ELECTED—SOCIAL FEATURES OF THE JOINT MEETING.

Fifty years ago on all Manhattan Island there was only one telegraph office, and that one was located in Jersey City. Henry Reed was even then a bright and accomplished electrician, but neither he nor any one else knew how to make a submarine cable, and the Hudson River could not be spanned by a wire hung from high masts anywhere below West Point. One chief clerk took in the messages at the New York receiving office, sent them across the river by ferry-boats making hourly trips, and the operator at Jersey City forwarded them as far as Philadelphia, where they were handed over to "other lines." If a message reached its destination the day it started the feat was a marvel; when a reply was received the same day it was a miracle. Then the entire New York telegraphic force numbered not more than five persons; now it exceeds 5,000, while the number of telegraphers in the country runs far beyond 100,000. It is the custom of the craft to hold occasional reunions for the purpose of renewing and extending acquaintance and recounting experiences. Last week, on the invitation of Mr. Edward C. Cockey, the able and popular superintendent of the Western Union Supply Department and the chairman of an entertainment association composed of the entire electrical fraternity of New York city and vicinity, such a meeting was held in this city and many telegraphers from all parts of the country were present. At the same time the annual meetings of the Old Time Telegraphers' Association and the Society of the United States Military Telegraph Corps were held.

These organizations were formed 15 years ago. The former is made up of pioneer telegraphers and has a membership of about 800 or 900. The latter is composed exclusively of operators who served in the army during the war and its membership has gradually decreased from 1,200 to 500.

The Broadway Central Hotel was telegraphic headquarters for the week and the business meetings were held in its parlors.

THE OLD TIMERS' MEETING.

The Old Timers assembled at 10 o'clock Wednesday morning, September 11, with President E. C. Cockey in the chair. Mayor Wm. L. Strong made a most cordial and eloquent informal address of welcome, which was enthusiastically received, after which the president read his annual address as follows:

Were it the olden time, it would be proper to tender to you the freedom of this great city in a gold snuff-box; but as this time-honored custom has gone out of date and we have struck a more modern age, when men's lives are so wrapped up with their business engagements, and when the struggle for existence is so sharp and keen, and when time is so highly prized, and when pleasure and enjoyment and social intercourse are so little thought of, we will not tempt you with such a gift, but will assure you of our intention to make amends for this failure on our part by doing all we can to make your stay with us instructive and enjoyable. We greet you in behalf of the Committee of Arrangements and offer you a hearty welcome to New York.

Your secretary, etc., will tell you of the amount of cash that is on hand, and which I fear is becoming a responsibility of importance to him. This fund requires care. It has it, for he has taken pride in accumulating it; but to what end? Why should an organization like ours need a fund that cannot be touched? Its collection means a strain on the pockets of the members—a strain for no definite purpose. The fees and dues should be as light as possible. Our demands on the members should be for means to meet all current expenses, and not to amass a fund for some unknown purpose. Your initiation fees and the yearly dues should be small, so that the drain on the members' pockets shall be less than it has been heretofore. Either this, or arrange so that the funds due and received shall be availed of to the advantage of the association. Let it be spent in behalf of reunions, so that when we meet in localities not heretofore visited by us, our friends there shall not feel that they are called upon to tax themselves for our entertainment.

Your by-laws need revision. As it is now, members can only be elected at the annual meeting. Your Executive Committee should have power to elect members at any meeting; should have power to disburse your funds and should be to all intents and purposes the managing power of your association. The spirit and intent of the by-laws meant this, but the phraseology does not say so. I recommend a complete revision, and your Executive Committee will present a revised constitution and by-laws for your consideration. It has met with their approval. Give it yours, that the association may be based on a better foundation and prove its strength and durability by a rock work on which it can stand for ages.

At last year's reunion the name of the association was amended by the addition of the word historical. I believe I was the only member present who voted against the change. Time has confirmed my opinion and strengthened my belief that our association should return to the old name, which for 14 years sufficed and pleased us. Let us go back to it. Let our application for membership blanks serve for history. Let each applicant be his own historian. Who more competent? Who more truthful? The preamble sets forth the objects of our association. Let us live up to them. Let us promote them. What more is wanted? Comply with them and we have done well. Extend the field of our influence. Encourage all who are eligible to join. Bring them within the fold of good-fellowship and sociability, and our work will have been well done. Our reward will be our own satisfaction, and our society will be permanent.

The Morse system of telegraphy is now in the 52d year of its existence. From a single-wire, 40-mile line between Baltimore and Washington, it has extended to be a network that encompasses the whole globe. From the device of a single man—a hobby—a toy—a pet scheme which earned for him, from every one to whom he exposed his plans, the nickname crank—has developed the grandest system of news carriage that ever was thought of. Even his fondest hopes, his extravagant dreams, his impossible ideas of the future, have been surpassed. What impoverished him to introduce, and to make feasible, has been the means of producing untold wealth, of making armies move, of making victories possible, of joining great nations together, and of making peace universal. Not an industry in the land that does not avail of it. Not an item of news, be it much or little, that is not grist to its mill. Distances vanish under its influence. Those afar off are brought near to each other. It is the harbinger of life and death. It has the wings of love. All are under its influence. The high, the low, the rich, the poor, all pay it tribute.

The progress of the telegraph has been slow—far more slow than of all other branches of electricity since developed—but it has been sure. No step has been carelessly or

thoughtlessly taken. It has been step by step, through 51 years of the best experience of materials, tools and instruments that the minds devoted to this great work could devise, and there has not been any retrograde movement at any time. The word has been "forward." The motto has been "excelsior," and we are what we are to-day. We have the best system of commercial business that was ever devised; touching more places, involving more interests, and providing more substance than ever was dreamed of; contributing much talent to other pursuits, and carrying into them many advanced thoughts, making in them all things possible and desirable. The messenger of to-day may be the millionaire of the generation to come. It has been and it will be again.

My friends, Morse looked over the field of electricity. His mind foresaw great things; but with all its visions he had no conception of what has actually come to pass. The bars to that field have been taken down, but we have not entered yet; we are still outside, and we have not wielded the power that is there on storage for our use; but people are waking up to the vastness, to the importance of the subject, and the time is near at hand, not far away, when electricity will be the moving power for all purposes.

The telegraph was the inception of all improvements, of all inventions, of all theories, of all devices, that made the present advance possible; and while it was slow to proceed itself, it was the incentive that gave impetus to all other branches of electrical science, and they owe their practical existence to it.

The more we study the objects of this association the better we are pleased with them. We who are separated from each other by business distances are brought near to each other by the ties of *auld acquaintance*. Our association means this and means nothing more. We who commune with each other by wire daily find growing up within us a strong desire for a more personal contact. We have conceptions of each other which we wish to realize. The only way to do it is to meet and enjoy, though only for a brief period, each other's presence; and for this we are organized; this is our purpose and sole aim, this the groundwork of our structure. Let us encourage the feeling. It is one of good-fellowship that ought to last as long as life, and ought to be a pleasant memory to each and every one of us. To this end I exhort you to look well after this association. Guard its interests. Maintain its objects. Increase its membership, and do all things necessary to strengthen it and to make it permanent.

I have to thank this association for the honor conferred upon me by making me its highest officer. No man ever accepted the place more reluctantly. No man has been more enthusiastically supported. Every one, be he officer or layman, has done all he could do to make my lot an easy and a satisfactory one. From first to last, the cry has been to please the president; and now, when I give up the office, I can truthfully say my lot has been an easy one, my burden light, my honor great and the success assured of the Old Time Telegraphers' Association.

In accordance with the recommendations of the president and executive committee, the constitution and by-laws were amended so as to eliminate the historical feature and make the purpose and sole aim of the organization the promotion of good-fellowship and sociability. Other amendments gave the executive committee power to manage the affairs of the association and disburse its funds, relieved past presidents and military telegraphers from the payment of dues and provided for a yearly salary of $300 for the secretary.

Pittsburgh was selected as the place for holding the next annual meeting, and the following-named officers were elected:

S. A. Duncan, Pittsburgh, president; J. D. Flynn, Pittsburgh, vice-president; Wm. J. Dealy, New York, secretary and treasurer; executive committee: Robert Pitcairn, Pittsburgh; John Campbell, Pittsburgh; Morris W. Meade, Pittsburgh; S. P. Peabody, Columbus; L. A. Somers, Cleveland.

Mr. Duncan is well known to all readers of the ELECTRICAL REVIEW as a former president of the National Electric Light Association.

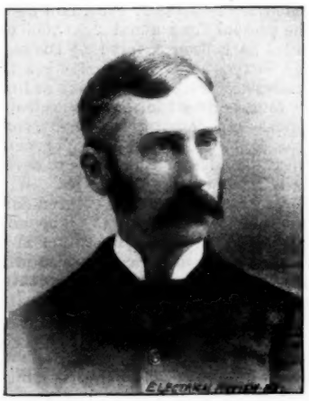
Mr. Dealy in on the executive staff of the Western Union Telegraph Company and is popularly known throughout the country as "everybody's friend."

He has held his present office in the Old Timers for 10 years, and attends to all details of the association in his usual active and efficient manner.

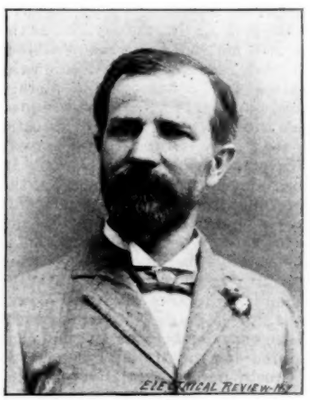
THE MILITARY MEETING.

The Military Society met at two o'clock on Tuesday. President William R. Plum read his annual address in which he made an eloquent plea for the recognition by the War Department of the military telegraphers as members of the army *de jure* as they were *de facto*. The address related a dream which came to President Plum under these circumstances:

One of the first things the boys did to me on reaching this city was to take me to Delmonico's, where I constructed in my stomach a great sandwich, piling up course upon course and then submerging as much of it as became a temperance man who didn't count that occasion.



S. A. DUNCAN, OF PITTSBURGH, PRESIDENT OLD TIME TELEGRAPHERS' ASSOCIATION.



W. R. PLUM, OF CHICAGO, PRESIDENT SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS.

In the small hours of the night, when honest men should be in bed, I, too, of course, was there, tossing and tumbling while the chemical laboratory within me was working under difficulties. Then unconsciousness came with its dreams.

By the report of Secretary Pettit it was shown that nine members have died during the past year. They were C. F. Bort, New York; D. Byington, Leavenworth, Kansas; W. N. Embree, Leopold, Pa.; Joseph Hyne, Port Monmouth, N. J.; Robert B. Lines, Washington, D. C.; Daniel Murray, Red House, N. Y.; Sol. Palmer, St. Louis; Wiley W. Smith, Kansas City, and J. R. Clark, Michigan.

Among the new members elected there was the distinguished New York sculptor, Olin L. Warner. Mr. Wm. B. Wilson presented a very full report of the action during the last session of Congress to secure the passage of a bill authorizing the Secretary of War to give the military telegraphers a certificate of service. The bill passed both houses but was one of the 40 left unsigned by the President when the clock struck 12 on the fourth of March. The society determined to renew the attempt next session. General Thomas T. Eckert, A. B. Chandler, Charles A. Tinker and D. Doren, all of whom were prominent in the army telegraph service, were in attendance at this meeting. The old officers were re-elected as follows:

President, W. R. Plum, Chicago; vice-president, W. B. Wilson, Holmesburg, Pa.; secretary and treasurer, J. E. Pettit, Chicago. Committee on Congressional Action: W. B. Wilson, Holmesburg, Pa.; W. J. Dealy, New York; J. H. Emerick, New York; E. Rosewater, Omaha, Neb; Dr. J. E. O'Brien, Scranton, Pa.

GOOD-FELLOWSHIP AND SOCIABILITY.

With the close of the military meeting, at 3.30 P. M., everything was given up to the important function of the occasion which had really commenced the day before with the arrival of the first visitor. The New York men, under the admirable leadership of President Cockey, had spent the year in preparing to entertain their guests, and an elaborate programme was carried out with royal hospitality and charming courtesy. One of the most delightful features of the reunion was the presence of Mrs. Cockey with a large committee of ladies to receive and entertain the guests, among whom there were many ladies. For two days carriages were always in waiting for all who wished to visit the parks and other interesting places in the city.

Wednesday evening everybody went to Chickering Hall to attend an entertainment arranged and managed by Marion H. Kerner, who proved himself to be an artist, poet, musical composer, singer and manager, and very satisfactory in all these callings. There were a variety of musical performances, vocal and instrumental, ventriloquism, dancing by the Merrilees girls, Marshall P. Wilder's funnyisms and other interesting things. The best of the show was Kerner's own productions. These consisted of stereopticon views of telegraphic scenes and portraits and several songs written and set to music by Kerner. An ode to Morse, sung by the audience to the tune of Maryland, had the refrain:

"Oh! bless his memory from on high,
Light of his genius never die!
In ev'ry land resounds the cry,
What hath God wrought!
What hath God wrought."

Thursday was devoted to a trip by specially chartered steamer to Long Branch, a drive through that city and the neighboring resorts and a banquet at Jaeger's, with a most unique *menu*, which required four hours of steady attention. The remainder of the week was spent in general sight-seeing and visiting. During the entire time of the reunion every possible attention was shown the visitors, and for lavish expenditure of money and elegant entertainment the New Yorkers touched high water mark, which had never been reached before and probably never exceeded hereafter. On the return trip from Long Branch the visitors passed the following resolution:

Resolved, That we, as the guests of the entertainment society and the electrical fraternity of New York city and vicinity, cannot separate without a formal expression of our appreciation of the many courtesies and lavish entertainment provided by them during our exceedingly pleasant reunion, and we hereby tender our sincere thanks.

The representatives of the electrical press in attendance were George C. Maynard, of the ELECTRICAL REVIEW, and J. B. Taltavall, of the *Telegraph Age*.

The Marks Electric Sparks.

The "Marks Electric Sparks," an association composed of the principal workmen of the Bishop Gutta Percha Company, of New York city, accepted an invitation of their superintendent, Captain W. Wolcott Marks, of the glorious Ninth Regiment, of New York, and accompanied him and his excellent company of well drilled National Guardsmen to New Dorp on the 7th inst., and there enjoyed a sumptuous repast, spread for the delectation of the most fastidious gastronomist. Captain Marks, after whom the association is named, is a prominent member of many societies and organizations, and has the proud distinction of being longer connected with the manipulations of gutta percha and similar compounds for the insulation of copper wires for all electrical purposes than any man in America—an unbroken period of over 26 years.

He also has the honor of constructing and laying the first copper armored submarine cable for lighting electric buoys, this cable now being used by the United States Light House Department to light Gedney's Channel.

The trolley party as a means of raising church funds seems to be a pronounced success. It proved such, at least, with the experiment made by Father Conway of St. Gregory's Catholic Church in West Philadelphia recently. Forty cars of the Hestonville line were crowded with people, about 3,000 in all, who paid 50 and 75 cents each for the ride over the lines of the company.

ACCUMULATOR TRACTION.

BY MAURICE BARNETT.

Now that storage battery cars are to be introduced in New York on the Fourth Avenue Railway, on the understanding that if storage battery traction prove more practicable and economical than other representative traction systems, the cars on the Fourth and Second avenue lines will be equipped with storage batteries, it is a matter of considerable interest to railway and electrical men to know how far the hopes of friends of the storage battery are liable to be realized, and what showing battery traction will make against its competitors, (1) the trolley system and (2) the underground conduit system. In this connection it might be said that although the underground conduit system has obtained a foothold here sooner than the storage battery system, it is very doubtful whether the former will ever come into general adoption. The closest estimates on total investment, including real estate, road and complete equipment —estimates based on a study of the systems in New York and Washington—put the cost of the underground system at about $100,000 per mile of track length, or between three and four times that of the storage battery system. Moreover, the total operating expenses of the underground system, including interest on investment, is about 19 cents per car mile against 15 cents for the trolley. This large difference is accounted for by the excessive interest charge which the former system must pay. The necessity for some system other than animal traction and trolley traction has, of course, led to the adoption of the underground conduit, but it is almost certain that just as soon as it shall have been demonstrated that storage battery cars can compete, under certain conditions, successfully with the trolley system, underground conduit systems will play an insignificant part in the development of electric traction systems in the United States.

The Electric Storage Battery Company, of Philadelphia, which is putting in the new cars in New York, appear to be more than sanguine as to the results which will be obtained with the new cars which, in many respects, embody radical points of departure from previous types of storage battery cars. The Storage Battery Company are basing their estimates as to capability of their cells upon actual knowledge of the work that is daily being done with the "Chloride Accumulator" in storage battery traction in France, where a type of battery similar to that to be employed in New York has given more than satisfactory results.

There has never been any doubt as to the advantages possessed by a storage battery system of electric traction; the only doubt ever expressed being one concerned solely with the question of operating expenses. The great drawback has not been—as many persons think—the weight of the battery, but the cost involved in the maintenance and handling of the cells in traction work. In the old style storage battery cars the battery was placed in the sides of the cars under the seats. The expense of inserting and removing this each trip added considerably to the operating expenses. In the new cars the battery will be placed under the car where it can be handled easily and at about one-quarter the former cost of this operation. A report by Mons. J. Sarcia, which can be found in the "Bulletin de la Société International des Electriciens," leads to the hope that the cost of maintaining and handling batteries in traction service will be, in the style of car suggested, something under three cents per car mile. We hope subsequently to be able to show that this amount can be made up by a saving in interest, a diminished expense for maintaining motor equipment and a smaller cost for the motive power.

The favorable features of a storage battery system of traction are well known and have reference to the fact that each car is a unit by itself, independent of the power house, during its trips, and in no way embarrassed by derangement in the station or overhead equipment, differing, in this respect, from the trolley system, where a stoppage in the power house or trouble on any section of the circuit may hang up all the cars on the line or in the section, as the the case may be, until the trouble is removed. Again, as the load on the engines and dynamos in a storage battery system is constant, it follows that these need not have greater capacity than is sufficient to satisfy the average demand for power. In the trolley system the capacity of the power plant must be such as to enable it to respond to the maximum demand made upon it. As this demand is very variable, being anywhere from 20 to 300 per cent above the average demand, it follows that the power plant for a storage battery system will be considerably smaller than that required for the trolley system. O. T. Crosby puts the relative capacity required by the trolley and battery system power plant, respectively, as 1 : ⅔. In other words, the battery system will require a power plant only two-thirds as large as that required by the direct system. In considering, later on, the relative cost of construction under the two systems, this ratio will be taken. (This, incidentally, emphasizes the value of an auxiliary storage battery plant for roads already equipped with the trolley system, the storage battery serving as a reservoir to store up the energy representing the difference between the average and the maximum demand on a generating plant, and as a regulator, enabling the engines and dynamos to be worked at a constant load and securing them from the strains and stresses to which they would otherwise be subject.)

Furthermore, in the storage battery system there is no loss of pressure in "feeders" and "line;" the grounding of one motor does not affect others; the durability of the motors is greatly increased by reason of the low pressure used in this system; and lastly, there is not the unsightly trolley line with the attendant danger to life and property growing out of the high tension current and obstructive wires employed in the direct system. In the event of a positive proof that the storage battery car is capable of efficient service at the same or even slightly greater expense than the trolley cars, attention will again be directed to the advantages of the storage battery system—when a tendency may be manifest to limit the construction of overhead lines and multiply that of the storage battery system—the first system of electric traction tried here or abroad, and neglected only because the difficulties in the way of its adoption were not worked out so quickly as in the case of its competitor, the trolley system.

In order to arrive at an approximate cost of traction by storage battery cars, we may consider separately the various factors entering into this. What chiefly interests us is the factor of maintenance and handling. This, according to the report of Mons. J. Sarcia, already referred to, was three and one-third cents per car mile; a figure, however, susceptible of marked reduction. In order to explain this and at the same time to show that the basis of above figure was a set of conditions not wholly favorable to storage battery traction, it may be interesting to give in brief a synopsis of M. Sarcia's report, descriptive of the industrial application of accumulators to electric traction made by the tramway of Paris and the Department of the Seine on the lines of Saint Denis to Paris and of Saint Denis to Neuilly.

The lines in question—which are known as one, Saint Denis–Madeline; two, Saint Denis–Opera; three, Saint Denis–Neuilly—have their termini near the depot of Saint Denis. On these lines electric traction superseded horse June 1, 1892, and up to the present time about 2,000,000 car miles have been covered by the storage battery cars. On these lines the grades are fairly severe, being as high as four per cent for considerable distances and ranging frequently from two to two and one-half per cent. On the Madeline line each car covers daily from 88.8 to 97.5 miles. With horse cars the distance covered daily was not over 60 miles. The conditions on the Opera line differ in so much as the motor car tows an ordinary car holding 50 persons, making 100 persons carried in all on this line by each motor car. On the Neuilly line each car makes two trips out and back on the Opera and Madeline lines, or about 30 miles on a single charge of the battery. On good Vignole rails, where the traction co-efficient was only 13.2 pounds to the ton, the distance covered on each charge of battery was no less than 70 miles. Continuing, M. Sarcia points out that in order to replace a discharged by a fresh battery, it was necessary to handle 24 trucks; the men having, frequently, to roll these the entire length of charging room, involving a very large expenditure of labor. The necessity for this grew out of the circumstance that the company, instead of building a modern power house, with every convenience for reducing the handling of the batteries, rehabilitated the old horse car stable and converted it into a charging room. Obviously economy in handling could not be expected under such conditions. Moreover, instead of supporting the battery under the car, it was placed in the sides of cars underneath the seats. Sarcia estimates that in the style of car to be used in New York a saving of .6 cents per car mile could be effected in handling. Subtracting this from three and one-third cents given as a result actually obtained in practice, we have 2.7 cents as cost per car mile for maintenance and handling of battery.

Regarding cost of power, this will depend on price of coal at power house, cost of labor, oil, waste, water and other supplies—illustrating the difficulties encountered in making a comparative estimate of costs of power in different systems. From a paper by T. S. Badger on the cost of construction and operation of electric railways, we find that the average cost of power per car mile of 22 trolley roads with from three to 140 cars in operation, length of track three to 51 miles, daily mileage 80 to 150, average daily mileage 110, was 1.96 cents. Now, as in the storage battery system, engine and dynamos are run at a constant load it is safe to assume that cost of power, neglecting interest and depreciation will not exceed 80 per cent of the figure given, or 1.56 cents per car mile. Authorities are not wanting who ascribe to the storage battery system an even greater efficiency. In Dubuque, Iowa, with a comparatively small number of storage battery cars in operation, the cost for power was only 1.80 cents per car mile—bearing out the belief that 1.56 cents is quite within the limit for well-designed power houses operating a fair number of storage battery cars.

As already stated, owing to the low pressure used in the storage battery system, the durability of the motors is very greatly increased. The average maintenance cost of the rolling stock of the 22 trolley roads cited is 1.80 cents per car mile. M. Sarcia puts this factor at one cent per car mile. In New York, where every effort will be made to introduce the very best electric equipment and carry on the work under the most favorable conditions, it is safe to say that the true figure for maintenance of rolling stock will not be more than .8 cents per car mile.

Regarding maintenance of power plant, it may be said that inasmuch as the power plant in a storage battery system need be only two-thirds as large as that in a trolley system, the maintenance cost will be only two-thirds as large. As a matter of fact, it will probably be only one-third as much, since the machinery is free from the strains to which it is subject in the direct supply system. There being, furthermore, no external circuits, lightning is less apt to play havoc with the electrical part of the equipment.

Coming now to the question of interest on total investment, consider first the investment per mile of track length of the trolley system. Trolley construction, where iron poles are used and where, as in cities, the feed wires must be buried, will cost about $12,000 per mile of single track. As 16 to 20-foot cars can be had fully equipped for, say, $3,250 each, two cars (to the mile) will cost $6,500. Making an allowance of 15 horse-power per car at $10 per horse-power for power plant, but not including real estate or buildings, we have for the two cars $3,000. Cost of road-bed will add about $7,500 per mile of track, while real estate, buildings, etc., may be assumed to be $7,000 per mile of track, making a total investment of $36,000 per track mile. On the basis of 56,000-car miles run per annum per mile of track length, we have at six per cent per annum an interest charge of 3.85 cents per car mile run to be added to operating expenses. For storage battery construction there is an item approximating $7,600 for batteries for the two cars not found in trolley construction. On the other hand, a saving is effected of $12,000 for overhead construction, while the cost for power equipment and real estate is reduced by one-third, being $2,000 for the former and $4,666 for the real estate, buildings, etc. We thus have a total cost of construction of $28,267, or, say, $28,000; and with the same trackage as in the case already considered, we have an interest charge per car mile of 2.99 cents.

Assuming that in the two cases just considered maintenance of roadbed and track, transportation and general expenses will remain the same, we can arrange in parallel the values

already given. A general distribution of expenses per car mile is then as follows:

	TROLLEY.	STORAGE BATTERY.
Maintenance of roadbed and track	$0.54	$0.54
Maintenance of line	.18	
Maintenance of power p'ant	.36	.12
Maintenance of rolling stock	1.80	.80
Maintenance and handling of batteries	....	2.70
Cost of power	1.96	1.56
Transportation expenses	4.98	4.98
General expenses	1.26	1.26
Interest on total investment	3.85	2 99
Total	$14.93	$14.95

As given here, the cost of operating cars by the trolley and storage battery systems, respectively, on roads of 15 miles and upwards, with 20 or more cars averaging about 100 miles daily, with moderate grades—general conditions covering cost of fuel and supplies, wages, etc., being uniform—shows both systems to be on an equal footing. A set of conditions slightly in favor of storage battery construction would show greater economy for the battery system. Thus, if the length of track were large in proportion to number of cars run, the extra interest on greater relative cost of trolley construction would swell the operating expenses of the trolley system. Or, again, since item of fuel is the largest factor in "cost of power," localities where fuel is high priced would change the totals and make battery traction more economical.

In conclusion, it may be said that even if trolley traction were more economical than storage battery traction, the system would be open to the objections that, first, the cars are dependent at all times on the power house, and have no auto-mobile character as have battery cars; second, the moment the trolley leaves the line the cars are left in darkness; third, the high tension currents constitute a source of danger to the traveling public; fourth, the trolley line is unsightly; and fifth, overhead wires are a formidable obstruction to firemen engaged in the never pleasant work of fighting fires. Inasmuch as a successful storage battery system would be, both from the point of view of the public and the street car company, what Mr. F. L. Pape calls "an ideal solution of the problem of electrical transportation," it is evident that this system, having total first cost and operating expenses in its favor, is bound to have a speedy and wide development and play no insignificant part in the future history of electric traction in this and other countries.

B. & O. Belt Line Devices Claimed To Be Infringements.

The Baltimore & Ohio railroad's electric line in its tunnel under Baltimore has been attacked in court by the Siemens & Halske Electric Company. Papers in a suit for infringement of patent were filed in Baltimore on September 7. The suit is similar to that begun by the Siemens & Halske company against the Metropolitan "L," involving the use of the third rail as a conveyor.

In the Baltimore suit the huge electrical locomotive used to haul trains through the tunnel draws the current from an overhead conductor. The contact is a sliding one, and includes principles claimed to be covered by Dr. von Siemens's patent, which the Siemens & Halske company says the Metropolitan "L" is infringing. The General Electric Company will undoubtedly defend the Baltimore suit.

ELECTRIC RAILWAY NOTES.

Receiver Henry C. Payne denies the report quoting him as saying that the Milwaukee, Wis., Street Railway Company would be out of the receiver's hands in 60 days.

The Brooklyn Heights Railroad Company, of Brooklyn, N. Y., has established 11 new transfer stations, and it is now possible to ride over almost the entire system for a single fare.

The Snaefell Mountain Electric Railway, on the Isle of Man, was opened for traffic in the latter part of August. On one day last month 12,000 visitors were landed at Douglas and within one week 26,000 arrived on the island.

With the consolidation of the three great electric railways of Philadelphia into one system comes the statement that the network of tracks which now gridiron the city will be so connected that cars from any portion of the city will run to the suburban resorts without change.

The Reading Railroad on September 13 tore up 200 feet of the track of its Round Top branch, at Gettysburg, Pa., which had been leased to the electric railway and used by it for two years as a part of its circuit on the battlefield. The work was done before daylight. No explanation was given.

The road of the Suburban Traction Company will be sold at auction at Orange, N. J., on October 14, to satisfy a mortgage of $1,500,000 held by the American Loan and Trust Company, of Boston, on which bonds were issued. The proceeds of this sale will be subject to all of Receiver Whittlesey's certificates and to the underlying mortgage of $60,000 held by the Orange National Bank.

The Central Wisconsin Electric Company, which about a year and a half ago was granted a franchise to put in an electric road in Oshkosh, Wis., has been sued by the Paul Perrinzo, Jr., Cedar Tie and Lumber Company, of Marinette, for $1,613.02, alleged to be due for cedar ties and poles. James K. Tillotson, the promoter of the enterprise, E. E. Stevens and W. F. Gruenwald, the two leading Oshkosh supporters of it, and the city treasurer, have been joined in garnishment.

The property of the Pueblo, Colo., Street Car Company, including charter, franchise and all property belonging thereto, has been sold at trustees' sale. The property was bid in by Albert E. Pattison, representing the General Electric Company, which held the Pueblo Street Car Company's bonds as security for the debt. The sale price was $400,000. The new company will be known as the Pueblo Electric Street Railway Company. The directors of the new company for the first year are S. Dana Greene, Havard D. Levis, of Schenectady; Irving Hale, Albert E. Pattison, of Denver, and H. E. Chubbuck, of Pueblo. The officers are: S. D. Greene, president; H. E. Chubbuck, vice-president, general manager and assistant treasurer, and Irving Hale, secretary and treasurer.

The Espersen Incandescent Water Heater.

A novel electric water heating device has been placed on the market by the Pacific Electric Company, 108 Tenth street, Tacoma, Washington. It is called the Espersen incandescent water heater and is shown in the accompanying illustration. The device, which is simple and claimed to be very efficient, consists of a copper tank in the bottom of which are inserted copper cones which have been treated chemically so that they will

THE ESPERSEN INCANDESCENT WATER HEATER.

radiate the greatest possible amount of heat. Placed inside the cones are incandescent lamps which form the heating power for the tank. The lamps and cones vary according to the size of the tanks, which range from one to 25 gallons capacity. Each tank is furnished with a switch, which regulates the lamps and temperature. The operator can turn on the heat in one, two, three or four cones, as he may wish, securing any degree of heat up to the boiling point. The tanks are furnished either nickel plated or in bright copper finish. Those now in use are said to be giving the best of satisfaction. The Pacific Electric Company also furnishes coffee and tea warmers constructed on this principle for use on dinner tables. Any hot water tank can be equipped at slight expense with the lamps and cones.

The earnings of the Edison Electric Illuminating Company of New York, including the Manhattan and Harlem companies, for August were as follows:

	1895.	1894.	Increase.
Gross	$122,517.50	$112,926.23	$9,621.27
Net	53,015.03	43,680.76	9,324.27
Gross, 8 months	1,194,173.80	1,046,279.06	147,894.74
Net, 8 months	584,255.04	498,758.33	85,496.71

Mr. William C. Dart, of the Rhode Island Tool Company, Providence, R. I., was in New York last week and was a welcome visitor at the ELECTRICAL REVIEW office.

Who Wants Some of This?

TO THE EDITOR OF ELECTRICAL REVIEW:

Inventor and sole proprietor of a practical and entirely new invention, which has required years of work and study, I desire, at least, to utilize the same. May I rely upon you to find an honest capitalist in whom I may rely implicitly? There are incalculable amounts of money to be made by my invention in the United States. My invention permits to store and transform for any kind of use a natural force gratuitously and inexhaustably. A very liberal offer will be made to any one who will join the enterprise; *i. e.*, taking out patents, constructing the apparatus, exploitation of the invention, organization of companies, advertising, etc. All necessary information will be furnished to any real applicant. The proposed enterprise is of colossal magnitude and exceeds by far my means. See what you can do. The invention has numerous applications. Hoping to hear from you, I remain,

PROF. P. MARSHALL,
4 Rue Sainte Croix.
Lyons, France, September 1.

Windings for a Small Motor.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have a small electric motor (as per enclosed diagrams) and wish to wind it for 110-volt circuit. If you will kindly advise through the columns of your paper, or otherwise, what sized wire to use for field and armature and how to connect, I will consider myself under great obligations to you. Thanking you for the trouble and hoping some day to be able to return the favor.

Very truly yours,
EDWIN R. PEASE.
Poughkeepsie, N. Y., September 11.

[The questions asked by our correspondent are answered technically in "Armature Windings of Electric Machines," by Parshall & Hobart, price, $7.50, and popularly in "Practical Directions for Armature and Field-Magnet Winding," by Trevert, price, $1.50. These books are supplied, postage free, from the ELECTRICAL REVIEW office on receipt of the price.—ED.]

Center Slot Rails in City Streets.

TO THE EDITOR OF ELECTRICAL REVIEW:

As a constant driver of a buggy upon city streets, I want to express my approval of the "Hoerde conduit system," as set forth in the ELECTRICAL REVIEW of September 11, which does away with the abominable center slot rails, so that you practically have only two rails to cross instead of three.

Yours truly,
ARCH. I. CARSON, M. D.
Cincinnati, O., Sept., 13, 1895.

Take a Hint from Mary.

[*From Printers' Talk.*]

Mary had a little lamb;
You do not look surprised;
Of course you don't, for Mary has
Been widely advertised.

And something you may learn from this,
If you are not a clam;
You can be just as widely known
As Mary and her lamb.

Your name can be a household word
And you be known so well,
That folks will confidently buy
The things you have to sell.

And when you once have got yourself
Into the cheering rays
Of the sunlight of publicity,
You bet your life it pays.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, SEPT. 18, 1895.

CONTENTS.

	PAGE
Views, News and Interviews	155
Wants to be an Electrical Engineer	155
Cost of Steam Power for a Central Station	155
Sextuple Electric Radial Drilling Mach ne	155
Electricity as the Medium of Transmission in the Brain	156
The Telegraphers' Reunion	156
The Marks Electric Sparks	157
Accumulator Traction	158
B. & O. Belt Line Devices Claimed to be Infringements	159
Electric Railway Notes	159
The Espersen Incandescent Water Heater	159
Who Wants Some of This?	159
Windings for a Small Motor	159
Center Slot Rails in City Streets	159
Take a Hint from Mary	159
Standard Bases for Incandescent Lamps	160
Wall Street and the Electrical Stock Market	160
Pesth's Telephone Newspaper	161
To Sue the Bell Company	161
An Artistic Lamp Catalogue	161
Power Consumption by Electric Railways	161
The Nantasket Beach Electric Road a Success	162
The Causes of Atmospheric Electricity	163
The Yield of a Welsbach Burner	163
A New Wire Winder	163
The World's Record for Steam Railway Speed	164
Our Boston Letter	164
Erie Telegraph and Telephone Company	164
Telephone News and Comment	164
Royalties on Invalid Patents	164
Suburban Electric Railway Extension in Ohio	165
"The Best on the List."	165
Death of Henry Bentley	165
Advance Information	166
Electric Locomotives to be Tested in Peru	166
Niagara Falls Power Company Refuses the Buffalo Franchise	166
The Tesla Multiphase System	167
The Baltimore Electric Locomotive	167
The British Association	167
An Electrical Exhibition Assured	167
Electrical Patents	168
Kind Words	xi
Kindred Interests	xii
Improvements on the Brooklyn Heights Road	xii

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE
Abendroth & Root Mfg. Co., boilers	xviii
American Electrical Works, insulated wire	i
Armington & Sims, engines	xviii
Boudreaux Dynamo Brush Co., a new foliated anti-friction metal brush	i
Buckeye Electric Co., incandescent lamps	ii
Bunnell & Co., J. H., dry batteries	i
Columbia Incandescent Lamp Co	i
Day's Kerite, insulated wire	i, x
Goubert Manufacturing Co., heaters	xviii
Greeley, E. S., & Co., electrical supplies	xviii
Hampson, E. P., & Co., engines	xviii
Interior Conduit and Insulation Co., Lundell dynamos and motors	i
Law Battery Co., open circuit batteries	i
Lombard Water-Wheel Governor Co	xviii
Okonite Co., insulated wire	i, xviii
Partridge Carbon Company, motor and generator brushes	i
Phœnix Glass Co., globes and shades	i
Rhode Island Tool Co	xviii
Safety Insulated Wire and Cable Co	i
Standard Underground Cable Co	i
Stirling Co., water tube boilers	xviii
U. S. Telephone Construction Co., "M. & B." telephones	i
Weston Engine Co., engines	i

INSIDE PAGES.

Allen, L. B., soldering sticks	xii
American Bell Telephone Co	xv
American Electric Telephone Co., long-distant telephones	xiv
Baillard, E. V	167
Bain, Forée, engineer	168
Baker & Co., platinum	xi
Baxter, H. E., & Co., electrical supplies	x
Beacon Lamp Co., incandescent lamps	xii
Belden Machine Co., drop forging	xii
Benjamin, Geo. H., patents	xiv
Bickford & Francis Belting Co., leather	xvi
Brill, J. G., Co., railway cars	xiii
Brixey, W. R., Day's kerite wires and cables	x
Brush Electric Co., arc lamps	vi
Central Electric Co., incandescent light supplies	iii
Chisholm, A., & Co., commutator compound	xii
Colgate Company, Geo. L., lightning arrester	xi
Connecticut Pipe Mfg. Co	vi
Consolidated Telegraph and News Co	xii
Crocker-Wheeler Electric Co	167
Darlington, F. W., consulting engineer	xvi
Davis, B. C	xi
De Ronde, A. & Co., carbons	x
De Veau & Co., telephones	xiv
Dixon, Jos., Crucible Co., belt dressing	xiii
Duval, W. S., Jr., patents	168
Dyer & Driscoll, patent solicitors	168
Eddy Electric Mfg. Co., Eddy generators	xiii
Electric Launch Co	xvi
Empire China Works, porcelain specialties	xi
Eppenger & Russell Co., Valentine subway electrical conduit	167
Euler, H. C., mother-of-pearl	168
Faraday Carbon Co., carbons	168
Fleming, W. H., woven wire dynamo brushes	xii
Forest City Electric Works	xiv
Fort Wayne Electric Corporation, "Wood" apparatus	v
General Electric Co	viii
Globe Electric Light Co., incandescent lamps	vi
Harrisburg Foundry & Machine Co., Harrisburg ideal engines	vi
Homer, F. E., & Co., commutators	xvi
Hooven, Owens & Rentschler Co., electric railway and electric light engines	iii
Huebel & Manger, table push	xii
International Correspondence Schools	168
Jones, J., & Son	xii
Keystone Telephone Co	xv
Lane & Bodley, street railway engines	iv
Lehigh Valley Creosoting Co., creosoted timber	168
Lozier, H. A., & Co., Cleveland bicycles	xiv
Marshall, Wm., condensers	168
McIntire, The C., Co., connectors and terminals	xi
McKinney, C. H., & Co., fixtures	iii
Metropolitan Telephone and Telegraph Co	xiv
Moore, Alfred F., insulated electric wire	xi
Morris, Tasker & Co., poles and tubes	xv
National Telephone Mfg. Co., telephones	xv
New England Engineering Co	xiii
New Haven Car Register Co	iv
New York Belting and Packing Co., rubber belts	iv
New York & New England R. R	xiii
Ostrander & Co., W. R., supplies	168
Partrick & Carter Co., electrical supplies for housework	xi
Penberthy Injector Co	xvi
Philadelphia Telephone Co, Blake transmitter	xiv
Phillips Insulated Wire Co., wire	167
Pope Manufacturing Co., Columbia bicycle	xiv
Positions Wanted	168
Read, Robt. H., patents	168
Replogle Governor Works	xi
Rodrigues, M. R., premier baby	xiv
Royce & Mareau, electrical supplies	168
Safety Car Heating and Lighting Co	ix
Sanger, M. E., & Co., experimental and model works	xii
Schoonmaker, A. O., India mica	168
Scott Electric Lamp Co	iv
S. K. C. Specialty Co	viii
Smith, Jas., Woolen Machinery Co	xvi
Solar Carbon and Mfg. Co., carbon specialties	xvi
Southgate, W. B., & Co., meters	iii
Standard Electric Co., arc lighting	xii
Standard Thermometer Co., arc lamps	xiii
Stanley Electric Mfg. Co., S. K. C. two-phase system	ix
Stanley & Patterson, electrical supplies	vi
Stucky & Heck Electric Manufacturing Co	xvi
Syracuse Storage Battery Co	xv
Thayer Electric Co., electrical engineers	xvi
Universal Lighter Co	168
Walker Mfg. Co., railway motors	ix
Wanted Specialty	168
Washington Carbon Co., Helios carbons	x
Waterman, Chas. H., arc lamps	viii
Western Electric Co., supplies	x
Western Telephone Construction Co., telephones	xv
Westinghouse Electric & Mfg. Co., railway generators and motors	vii
Weston Electrical Instrument Co., measuring instruments	x
White-Crosby Co., contracting engineers	167
Whitney Electrical Instrument Co	168
Wilkinson, W. H., automatic wiping device	xi
Worthington, H. L., electric signs, etc	iv
Zogg, Nicholas	xii

STANDARD BASES FOR INCANDESCENT LAMPS.

A prominent and progressive incandescent lamp manufacturer writes to the ELECTRICAL REVIEW as follows:

As lamps are now sold at a very small margin of profit, it is essential that the cost be kept within certain limits, and the matter which I desire to write you in regard to, is the more uniform adoption of standard sockets in use. There are now three principal sockets; namely, the Thomson-Houston, Westinghouse and Edison. By reference to our cost sheets we note that the bases for our lamps to fit Thomson-Houston sockets cost between $7 and $8 a 1,000 more than do the Westinghouse or Edison bases. The cost of all the other odd bases in use to fit the various odd sockets in use, such as the United States, Brush-Swan, Mather or Perkins, Shafer or National and Hawkeye, is still an additional amount. It is, therefore, desirable that, as far as possible, the best style of socket be used in original installations.

The time is not far distant when an additional charge must be made for lamps that are mounted in other than Westinghouse or Edison style bases. We ourselves would prefer the Westinghouse style. As the Edison and Thomson-Houston sockets are practically made by the General Electric Company, they would no doubt be glad to eliminate entirely the Thomson-Houston base. We at present understand that the General company are charging one cent more for lamps with Thomson-Houston bases.

We think that there are by far too many types of bases now in use, and are heartily in accord with any equitable means of adjusting the matter to an approximate standard. The consumer, as well as the manufacturer, will benefit by such a movement. We suggest, however, that the matter is one for the manufacturers to adjust among themselves, and believe that if all are approached in a proper spirit some means of reaching a very desirable result can be evolved.

Mr. Maurice Barnett, in his paper on "Accumulator Traction," published in this issue of the ELECTRICAL REVIEW, speaks glowingly of the possibilities of storage batteries for railway work. These possibilities will shortly be demonstrated practically on the Fourth avenue horse-car line in New York city. Mr. Barnett doubts whether the underground trolley system will ever come into general use, and yet the Metropolitan Traction Company has recently announced that it will equip all its lines in New York city with this system. Apparently we are on the eve of a very pretty comparative test.

Nazr Ullah Kahn, who has been visiting Queen Victoria, carried back to Afghanistan, among other things, a toy electric railway and an incandescent lamp to wear in his turban. Thus is the fame of electrical progress spread.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The market for Stock Exchange securities has weakened materially during the week owing to the dominating influence of uncertainty as to the government's financial outlook, the condition of the treasury reserve and the large gold exports. The continued strength of exchange has been a great surprise, even to the master minds of finance, and has rendered the task of the great loan syndicate an extremely difficult, if not precarious, one. Rumors continue to be circulated predicating an impending new large issue of United States Government bonds and find credence in usually well informed circles, for the reason that the expedient of soliciting contributions in gold from the New York city banks, to relieve the syndicate of part of the strain of making good the impairment of the treasury gold reserve, is pretty close to a last resource. Nevertheless, not a fragment of official confirmation of the rumors had been obtained up to the close of business on Saturday. Consideration of these grave questions of paramount importance, both in and out of Wall street, has completely overshadowed all other developments that might ordinarily have affected the prices of securities in one or the other direction.

In the electrical stock market Western Union, General Electric and Erie Telegraph have been the features in point of activity and extent of fluctuation. The directors of the Western Union Telegraph Company, as had been anticipated, owing to the recommendation of the Executive Committee on the previous day, on Wednesday declared the regular quarterly dividend of 1¼ per cent, payable October 15. The estimated returns for the September 30 quarter were not of a charactcer to cause special enthusiasm. They show some improvement over last year, but the company has evidently not obtained its due proportion of the increased telegraph business of the country. The statement follows:

	1895.	1894.	1893.
Net revenue	$1,850,000	$1,800,000	$1,800,000
Int. & S. F.	243,500	243,500	233,346
Balance	$1,606,500	$1,556,500	$1,566,654
Dividend	1,191,945	1,192,000	1,185,000
Surplus	$414,555	$364,500	$381,654

The annual meeting of the company will be held on October 9. The volume of business in the stock was fairly large and it closed 1⅜ lower than the final price of the previous week, at 92¾.

General Electric was also an active feature of the general market, and as a result of the week's operations, a net decline of 4½ per cent is shown. The final price, 36½, was the lowest of the week. The opening on Monday was at 41. The debenture 5 per cent bonds of the company were only moderately active around 90.

Erie Telegraph yielded to the unfavorable general influences and closed at 60¾, as against 65, the highest point of the week. North American was only nominally active, but displayed moderate firmness in tone at a slight fractional advance, and closed at 5½.

Edison Illuminating Company of New York first 5's were inactive and unchanged. This was true also of the consol. 5's. The stock was dull at 99⅝.

American Telegraph and Cable, on limited dealings, advanced 2 per cent to 94.

As a result of the experiments made this week by the New York, New Haven & Hartford, in the moving of freight cars by electricity on the Nantasket Beach system, President Clark stated that the New York, New Haven & Hartford would undoubtedly adopt a system of electric surburban traffic in a short time. He also said that electric motors at frequent intervals would carry freight cheaper and better than steam.

It is reported from Pittsburgh that the Westinghouse Electric company now has in its employ at its new shops in Brinton about 4,000 hands and that the greater part of them are working extra time. The company is taking no contracts for earlier than 60 to 90 days' delivery. In spite of all of the difficulties arising from the removal of its works the Westinghouse is said to have secured a large percentage of all the big electrical contracts.

Edison Electric Illuminating of Brooklyn reports for August compared with 1894: Gross earnings, $51,328, an increase of $21,076; operating expenses, $34,380, increase, $15,479; net earnings, $16,948, increase, $5,597; less taxes, $5,200, an increase of $4,100, and fixed charges of $3,541, an increase of $1,458, leaving surplus of $8,206, an increase of $38.

The returns for the same period of the New York company, including Manhattan and Harlem companies, show: Gross earnings of $122,547, increase of $9,621 and net, $53,015, increase of $9,324. For eight months ending August 31 gross earnings have been $1,194,173, an increase of $147,894, and net, $584,255, an increase of $85,496.

The Ulster County Electric Railway Company has been incorporated to construct seven miles of railroad from Kingston to Lake Kathrine, with a capital of $100,000. Among the directors are Charles A. Johnson, Frederick H. Reid, William C. Orton, all of New York, and William J. Tiero, of Philadelphia.

The Municipal Electric Light Company, of Brooklyn, has increased its capital stock from $500,000 to $1,000,000.

On the Boston Exchange, Bell Telephone touched 200¼ early in the week, reacting on Friday to 1:8½. On the day mentioned Erie Telephone also scored its high price, 64¾, but declined subsequently to 60. General Electric preferred was quoted at 71, and New England Telephone at 89 to 90. In the inactive department Ft. Wayne was bid 1¼, offered at 1¾; Westinghouse common, 37, asked 37½, and the preferred 55 bid, 55½ asked.

On the Philadelphia Exchange, Electric Storage Battery reached 46½ on Monday, declining to 44⅞ later in the week. The preferred was quoted at 45½ to 47. Welsbach light ranged between 82½ and 80¼. During the week the latter company declared an unusually large dividend of 20 per cent payable September 19.

BAIN.

September 14, 1895.

Pesth's Telephone Newspaper.

The telephone newspaper organized at Pesth, Hungary, has now been working successfully for two years, says the New York *Sun*. It is the only newspaper of the kind in the world. It is called the *Telephone Hirnondo*, or *Herald*, costs two cents, like a printed paper, and is valuable to persons who are unable or too lazy to use their eyes or who cannot read. It has 6,000 subscribers, who receive the news as they would ordinary telephone messages. A special wire 168 miles long runs along the windows of the houses of subscribers, which are connected with the main line by separate wires and special apparatus which prevent the blocking of the system by an accident at any one of the stations. Within the houses long, flexible wires make it possible to carry the receiver to the bed or any other part of the room.

The news is not delivered as it happens to come in, but is carefully edited and arranged according to a printed schedule, so that a subscriber at any time knows what part of the paper he is going to hear. It begins with the night telegrams from all parts of Europe. Then comes the calendar of events for the day, with the city news and the lists of strangers at the hotels. After that follow articles on music, art, and literature. The staff is organized like that of any other newspaper, and is on duty from 7.30 in the morning till 9.30 at night. After the copy has passed through the editor's hands, for the paper is subject to the same restrictions as ordinary newspapers and is liable for its communications, it is given to the "speakers." These are 10 men with strong voices and clear enunciation, who work in shifts of two at a time and talk the news through the telephone. There are 28 editions uttered a day. Additions to the first edition are announced as news items.

To fill up the time when no news is coming in the subscribers are entertained with vocal and instrumental concerts. These were at first given for them especially in the office of the *Hirnondo*, but now the wire is in communication with the opera house and the music halls, and on Sundays and saints' days with the churches. The music is transmitted at times to other places in Austro-Hungary, and recently the *Hirnondo* microphone was connected with the circuit going from Trieste, through Vienna, Bremen and Pesth to Berlin, the music being heard in all these places with equal clearness and force. The happy Hungarian can lie abed all day and hear everything that is going on in his town.

TO SUE THE BELL COMPANY.

FEDERAL AND STATE OFFICERS TO PROSECUTE THE CORPORATION FOR VIOLATING ANTI-TRUST LAWS.

A despatch from Chicago, of September 15, says:

A sweeping legal broadside against the Bell Telephone Company and allied corporations operating in this State, for violations of anti-trust laws, is among the certainties of the future.

The United States District Attorney has been asked to bring suit in behalf of the people against the Bell corporation for violation of Federal anti-trust laws. A request will undoubtedly be made to Attorney-General Moloney to prosecute the same corporation for violation of similar State laws. James E. Keelyn, president of the Western Telephone Construction Company, and also president of the National Telephone Protective Association, has submitted evidence to United States District Attorney Black bearing on the case.

Since Mr. Keelyn's first move in the case other evidence has accumulated which, it is claimed, proves a violation of anti-trust laws and the respective Federal and State officers are certain to act thereupon.

In the agreement between the Bell company and the Western Union, the former agreed to pay the Western Union company 20 per cent of all royalties on its telephone rentals, and the Western Union company agreed to abandon its existing exchanges and abstain from all telephone business. The contract expires nominally in November, 1896, but contains a provision for renewal. In 16 years the Western Union company is said to have collected about $5,000,000 of the Bell company's royalties.

Chicago is the best place to bring a quo warranto suit against the corporation, because it is in this city that the Bell company manufactures its telephones through the Western Electric Company. This is a tangible commercial point of attack.

An Artistic Lamp Catalogue.

The Buckeye Electric Company, Cuyahoga Building, Cleveland, Ohio, has just issued an elegant and artistic incandescent lamp catalogue. It is embellished with very creditable pen and ink sketches, and altogether forms one of the handsomest business books yet received by the ELECTRICAL REVIEW. It is sent free on request.

It is very gratifying to learn that the officials of the New York, New Haven & Hartford Railroad are entirely convinced of the success of the electrical equipment on the Nantasket Beach line. It seems that the passenger traffic for the Summer season of 1895, under the electrical regime, is 300 per cent greater than during the previous season, when the steam locomotives were used. The cheap and frequent trains have created this traffic. Recent tests have shown the perfect adaptability of the the electrical equipment on the Nantasket line to handle the freight traffic as well as passengers.

POWER CONSUMPTION BY ELECTRIC RAILWAYS.

READ BEFORE THE PENNSYLVANIA STREET RAILWAY ASSOCIATION AT WILKESBARRE, PA., SEPTEMBER 4, BY A. K. BAYLOR.

The subject seems to naturally divide itself into two parts: First, the apparatus itself, its efficiency and general construction; second, the handling of apparatus in practical street railway operation.

Properly a consideration of this subject should start with the coal pile, but it is proposed here to consider it merely in its relation to the electrical apparatus taking the power as it comes from the engine shaft.

One of the first questions bearing on the efficiency of the generating plant that must be considered is whether direct-connected or belt-driven generators are to be used.

The experience of the last two or three years has shown that direct connection has in most cases everything in its favor, and where land values are high and the units large, these two points alone will dictate the choice of the type of machine.

It was at first supposed that the great fluctuation of load, inevitable in railway work, would introduce a serious menace to the unit (*i. e.*, the engine and generator) when the two were rigidly connected; but this has been shown by repeated experience to be a negligible factor when a properly proportioned fly-wheel is introduced between engine and armature.

In comparing the two types of machines, the first consideration is apt to be the relative cost. As a direct-coupled generator is usually designed to give a certain output while running at slower speed than a belted generator for equivalent output, it must be large and cost more than the belted machine. From this difference in cost, however, must be deducted the expense of belts and several other money-saving features must be considered.

As already stated, the direct-connected machine takes less room, saving land and permitting the use of a smaller building. Only one foundation is necessary, instead of two, and although the one foundation must be larger than either of the two necessary for a belted unit of equal power, it will usually cost less than the sum of the two.

Furthermore, there are fewer bearings and wearing parts to care for, and last, but not least, a saving in efficiency of from 6 to 5 per cent, according to the proportion of load on the generator. This difference in percentage is due to the fact that the least possible friction loss, due to belting, is in the vicinity of four or five per cent, and even if this minimum is attained at full load, it becomes about 8 or 10 per cent when the generator is running at half load.

These considerations will usually effect a decision in favor of direct coupling, unless they are offset by a saving in interest charges due to an unusually low-priced belted generator.

The next point to be considered seems to be the proper division of the plant into units. Generally speaking, perhaps the best investment is made by the installation of three units of equal size, two of which are capable of carrying the full load. This permits efficient running at half load and full load, and leaves one unit always in reserve. It is, of course, desirable for the sake of efficiency and consequent economy of power to run all the working machines as near full load as possible, and to keep "on top" of the efficiency curve, and, with this object in view, some roads have made a division of power into, say, two large units, each equal to one-half the full load and one small one equal to one-quarter load. This permits full load running practically all the time as combinations of these machines will give one-quarter load, one-half, three-quarter and full load, but in case one of the large units gives out, the remaining one-half and one-quarter unit will have to be considerably overloaded to handle the full load of the station.

It is interesting to note how daily records of current output by readings taken every few minutes will show the separation of the day into distinct load periods, which will repeat themselves with astonishing accuracy from day to day when the same general conditions obtain.

For this reason, and because it is impossible to keep playing the generator units into combinations to fit all these fluctuations, it is necessary to choose a generator at the outset with a good efficiency curve. In other words a "flat" curve, one which rises to 90 per cent or thereabouts at a comparatively small load, and gradually rises with the load to a high maximum, running then on a practically horizontal line, until the load becomes excessive.

As contributing to this result the machines should run without excessive heating, which means ample capacity in conductors, commutators and armature, large radiating surfaces, good ventilation and sufficient bearings.

They must run free from sparking up to reasonable overloads, and must have insulation of sufficient resistance to prevent leakages to ground, and after all this they must be kept clean.

Buyers should also remember that the manufacturing companies whose engineers have made these points a matter of special study and have the experience of scores of plants to guide them, ought to be and are in a position to judge intelligently of the general proportions best calculated to give a certain result.

They (the buyers) should therefore confine their specifications, in a reasonable degree, to a list of conditions to be fulfilled—naming the heating, sparking and overload limits required, with other general features, leaving the means for reaching these ends, *i. e.*, the size of conductors, number of commutator bars, thickness of insulation and the thousand and one details of design which go to make up an efficient machine.

A great deal would be gained in this direction if consulting engineers fully realized that, unless they have given the matter enough study to qualify them as generator designers, they may, through insisting on some peculiarity of detail and receiving a generator fulfilling their specifications, get a machine inferior to what would have been furnished had the manufacturer been held accountable for results only.

As bearing on the general efficiency of the system, the line should be of ample capacity and of insulation sufficient to withstand the potential at all times, as it takes as much care to make an ampere of current to leak down a pole to ground as for another ampere passing to ground through the motor and doing useful work. The ground return capacity should, of course, be equal to the overhead feeder. An abundance of overhead copper with bad rail banding, with perhaps open circuits, is an absurdity. As affecting the life of the motors, the feeders should be distributed to deliver as nearly as possible an even potential all over the line, and while the voltage should not be allowed to drop too low, it also should not be raised any considerable degree above the normal point, as this puts the motor insulation under undue stress.

On this account, when cars run directly past the power house, the feeders should not attach directly to the line, but should spread in either direction and feed back to this point.

It is evident that when a motor has become dusty or moistened in service its insulation resistance is reduced, and any excess in potential above its safe limit will result in punctures of the winding and other leakages to ground; whereas, if the pressure be kept inside this limit, if by only a few volts, the bulk of such trouble may be avoided.

Of course, the motor is another factor of prime importance in the economy of power, and what has been said under generators regarding efficiency will apply in a general way here. A motor should be as light as is consistent with strength and power, and should be compact and protected by its frame.

The most important consideration in the purchase of motors may be safely said to be cost of maintenance, but this has no direct bearing on economy of power, much as it has to do with economy of operation.

As a power saver the most important part of the car equipment is the controller. The time has gone by when it was necessary to draw comparisons between rheostatic and series parallel control in considering equipments, yet a good many lines are operating rheostatic controllers without apparently appreciating the loss they are sustaining. Aside from the out and out saving in power by the use of series parallel control, which amounts to a clean 25 to 40 per cent, according to the series, it should be remembered that the necessary generating plant for operating with such controllers is much less than that required for the same car service under rheostatic control, not only because of the average economy of power, but because the momentary fluctuations of load, which must be taken care of, are much less violent, and this latter condition holds good in any case, even for a high-speed road, making few stops and where the motors are kept in multiple so much of the time that the *average* power consumed is practically the same for both methods of control.

Another practical advantage is found in the possibility of running all the cars at half speed in case of the disabling of half the power house capacity. This is an important consideration, for instance, on a stormy day, perhaps during a snow storm, when the first desire of patrons is to get aboard cars in large numbers, away from the weather and to be carried to their destination. At such a time the number of minutes consumed in getting there is usually a secondary consideration.

Tracing up the subject of operation at the power house, one of the most effective economies is the use of recording wattmeters registering the load continuously.

By this means, and in connection with readings on individual cars, load curves may be established, representing fairly (by the division of the day into load periods, as mentioned above, and the current output during those periods) the power which should be consumed to handle a given traffic. In this way a careful and intelligent comparison may be drawn between different days in season and between days of similar character.

Wattmeter readings on separate cars are of especial importance, establishing as they do for the unit what the station readings show for the whole system. Repetitions under all conditions will show whether a certain car should consume 800 or 900 or some other number of watt hours in running a mile, and any sudden or wide variation to-morrow from the standard load readings of to-day and yesterday will indicate a leakage of some sort and attract prompt attention.

Without such a system of checks in the delivery of current there is nothing but the sluggish coal pile to betray any irregularity in power consumption.

In addition to these guards a recording voltmeter should be used at the station or a voltage record kept at very frequent intervals, with a recording voltmeter. With due allowance for overcompounding, the theoretical record would be a circle, and in practice with a fairly constant load the record should approach this standard. If the voltage undergo wide fluctuations, comparing different times of the day, the generator is faulty, or the station man is negligent, and in either case the motors suffer, and they not only require a greater average current to do a given work at reduced voltage, but they will consume more watts in doing it.

An enormous factor in saving power is the degree of intelligence of the motormen. They are too often put upon cars with scarcely any preparation and are then practically left to their own devices, and naturally handle their cars uneconomically. They will often move the controller handle around the dial without regard to the notches, passing into No. 2 before acceleration of the first position has been felt, and so on to Nos. 3 and 4. It sometimes practically amounts to throwing the handle immediately into the first position. As far as economy of power is concerned, such men might almost as well have rheostatic controllers. The pity of it is, too, that as a rule the men are not to blame, never having received proper instructions.

A valuable aid in the education of motormen is the use of an ammeter in the motor circuit in plain sight, so that during their run the men can see the fluctuations of the instrument and note the results of incorrect handling as compared with the right method.

The plan followed by Mr. Know, of the Chicago City Railway, is certainly an excellent one. He has printed curves laid upon one plot, comparing the current fluctuations with right and wrong methods of starting, posted around the car barns and employés' rooms as a graphic object lesson, which has resulted in an economy of power.

Further than this, motormen should be instructed in the car circuits, with diagrams showing the connections at each position of the controller. With this knowledge a conscientious man would involuntarily make an effort in the right direction.

Another great coal consumer is the brake. A great amount of power is wasted by men who throw their controllers into contact before thoroughly releasing brakes, even when there is no danger of backing. They also throw on the brake before throwing off the power.

Very few men understand or attempt to use the momentum of their car to advantage. They will run with power on close up to a leading car and then apply brakes, when they might coast many feet using no current whatever. This momentum may also be used to advantage on curves, switches or wherever there is unusual resistance.

The careful scheduling of cars with respect to grades may be an important economy, and although it is a complicated problem, it is worthy of more attention than it is usually given.

Care should be taken to keep bearings and running gear in good condition, and to maintain track gauges. The wheels upon any truck should be made of the same diameter (a precaution frequently overlooked) to permit the motors to wear in perfect unison.

A full consideration of this heading leads into every branch of the operation of electric railways, and although the efficiencies of apparatus and the direct handling of it are the first things to consider, every fault in system or operation is directly or indirectly an attack on the coal pile.

The Nantasket Beach Electric Road a Success.

In an interview with a Boston reporter last week J. R. Kendrick, the third vice-president of the New Haven Railroad, said of the proposed extension of electrical equipment on the Old Colony division:

"We are entirely satisfied with our experiment on the Nantasket Beach business, the season having demonstrated the fact that the cheap and frequent trains create traffic. The passenger statistics for the Summer just closed show an increase of 300 per cent over those for the season of 1894, and next year we expect these figures will be beaten. The tests made the other day in the matter of demonstrating the practicability of electricity in its relation to the freighting business were also eminently satisfactory, and mean a great deal in the application of the current to all branches of rail transportation. In regard to the report that our company was taking steps looking to the equipment of the link between Nantasket Junction and Braintree with electricity, I am at liberty to say that it is in every way correct. The plan that will be carried out provides for four tracks, the two outer for trolley cars and the inner for steam. The center tracks will be fenced in so that there will be no possibility of injury to passengers when taking the electrics. We expect to have the line in full working order and running in connection with the Nantasket Beach branch by the first of next season."

"Are the other roads in this neighborhood interested in the experiments of the New Haven company?"

"Yes, they are keeping a close watch on whatever we do. It has been practically decided to use the current, in conjunction with steam, as far out as Readville and Dedham on the Providence division. There will be four tracks on the elevation, the outer ones being for trolley cars."

THE CAUSES OF ATMOSPHERIC ELECTRICITY.

BY PRINCE KROPOTKIN IN THE "NINETEENTH CENTURY."

We live in an atmosphere which is loaded with electricity. That the electricity which we find in the atmosphere may originate from various sources—from the evaporation of water which is continually going on on the earth's surface, from the unequal heating of superposed strata of air, from vegetation, and even from chemical changes which go on on the surface of the earth—was pointed out long since; and the relative importance of these different causes has remained a subject of controversy for the last 70 years; but it is only now that our ideas upon the whole subject begin to take a definite shape.

A few years ago in Switzerland Herr Lenard undertook a series of observations on the electrical effects of waterfalls. It appeared that, to say nothing of large waterfalls, even the small ones, a few feet high, send into the air considerable charges of electricity, provided they bring down a large amount of rapidly dashing water. The smallest jets of water, which drip on the rock-sides, and even roaring streamlets, have the same effect; while above the surfaces of quiet lakes no electrification of the air was detected, notwithstanding the constantly going on of evaporation. In further prosecuting his researches, Lenard came to the conclusion that the current theory which explains electrification in the neighborhood of waterfalls by the inductive action of the positive electricity which is usually spread in the air during fine weather, is not supported by observation. He also remarked that neither evaporation nor the mere rushing of water drops through the air would explain the phenomena, and that the chief cause of electrification of the air is the tearing asunder of the drops of water as they fall upon the wet rock surfaces at the bottom of the waterfall. From these shocks electricity originates, and while the surrounding air is loaded with negative electricity, the spray of water which rises at the foot of the waterfall is electrified positively. Laboratory experiments further confirmed this view. The amount of electricity developed by the mere passage of a jet of pure water through air, or when water glides upon an inclined smooth surface, is insignificant. The drops must fall upon a hard wetted surface and break into minute droplets in order to develop electricity. It appeared, moreover, that a slight addition of common salt to the water was sufficient to totally modify the effects, and to electrify air with a positive charge instead of a negative.

Lenard's observations and experiments thus give a new meaning to the experiments by which Lord Kelvin and Messrs. Maclean and Goto lately proved that air, even absolutely dust-free, can be electrified by a jet of water. By letting such a jet run for months within a vat inverted over a large wooden tray filled with water, so that all possible dust was eliminated, it was proved that air was electrified, and that it retained its charge for a certain time. It was also shown—and this is of great importance for the knowledge of atmospheric electricity—that the above source of electrification is by no means insignificant. It may be such as to bring masses of air and cloud into motion with nearly the same energy as they are moved about by differences of temperature. The amount of electricity which is sent in this way into the air is immense, and thus some support is given to the ideas developed by Planté and his follower Dary, and partly Palmieri, who maintained long since that atmospheric electricity must be one of the great causes disturbing the equilibrium of the strata of air.

The importance of these facts in the economy of nature is self-evident. The supply of electricity in the air is continually renewed. The waterfalls in the valleys, the splashing of the waves on the shores of the lakes and rivers, and the splash of drops of rain on the ground send masses of negative electricity in the air; even the watering of our streets and of our plants in the orchards has the same effect on a limited scale. On the other side, the waves of the sea, as they break against the rocks and fall back in milliards of droplets upon the beach, supply the air with masses of positive electricity, the amount of which rapidly increases after each storm. And when we stand on a sea beach, we not only inhale pure ozonified or iodized air; we are, so to say, surrounded by an electrified atmosphere which, as already remarked by Humboldt and often confirmed since, must have a stimulating effect upon our nervous activity as well as upon the circulation of sap in plants.

It might be presumed that the generation of electricity which, we now see, takes place when drops of water strike the surface of the rocks, or of water itself, is due to a mere mechanical action. Chemical action, as well as physical action, intervenes, as has recently been proved by Prof. J. J. Thomson. Viewing the subject in connection with all his previous work, the Cambridge professor has had the happy idea of extending that part of Lenard's experiments in which he endeavored to ascertain the effects of water containing different substances in solution being let to drop through different gases. It became at once apparent that the chemical constitution of both the drops and the surrounding gas was of first importance for the phenomena in question. A difference between the chemical composition of the liquid and the gas through which it dripped was required to produce a disengagement of electricity. Moreover, when the temperature of the dripping water was raised within certain limits, the electrification was rendered still more intense—a great variety of effects being obtained by varying both the substances dissolved and the surrounding gases, and the temperatures of both.

The conclusion which Prof. J. J. Thomson draws from these most suggestive experiments is of paramount importance for both this special subject and the theory of electricity altogether. The electrification of a gas, in his view, is not a mere mechanical process. It is a chemical or a quasi-chemical process which goes on within the molecules of the gas. Part at least of the molecules of the electrified gas must be split up into atoms, or at least the atoms must be temporarily dissociated as they enter into a new combination, in order to give up electricity. It is, therefore, the atoms of the gas, not its molecules, which carry electricity; a molecule of a gas, Professor Thomson maintains, cannot be electrified. As to the general bearing of Professor Thomson's ideas, it is sufficient to say that they make part of a great body of doctrine which endeavors now to bring science to consider electricity and chemical action as two moods of the same energy. But, in order that these views should become generally accepted, they must be brought into connection with the dynamic views on electricity developed by Faraday, Maxwell and Hertz. Perhaps a greater accumulation of facts and a deeper knowledge of electricity are required before science can be endowed with this further generalization.

A NEW WIRE WINDER.

The Yield of a Welsbach Burner.

L'Energie Electrique recently stated that, taking the yield of a Welsbach burner at nine candles per cubic foot of gas used, the same light may be obtained by burning a cubic foot of gas in a gas motor used to drive a dynamo; for with the motor 17.6 cubic feet of gas per horse-power per hour, and an efficiency of 85 per cent in the dynamo, while the lamp uses 3¼ watts per candle and lasts 800 hours, the quantity of power absorbed during the 800 hours is, for a 16-candle lamp, 48,000 watt hours, or 64 horse-power hours. This corresponds to 1,408 cubic feet of gas, or 1.76 cubic feet per hour for 16 candles, or 0.99 cubic foot per hour for nine candles, the same as the figure above given for the Welsbach. Forcing the lamp so that it has a shorter life gives, at the present prices of lamps, still better results. "But this," says the *Gas World*, "is surely the barest and baldest way of stating the problem. It may be that the cost of lamps may be set against that of Welsbach hoods; but there are other things to be considered besides the mere price of gas. And nine candles per cubic foot of gas in a Welsbach takes the Welsbach at worse than its worst; it is not even an average figure, while a steady light yield of 16 candles for 800 hours at 3¼ watts is not a well-known or common phenomenon. It may become so, possibly, but we are not there yet. The article goes on to say, and in this we quite agree with our contemporary, that the results obtained in electric lighting by limiting the area of distribution from each electric lighting station are much superior to those attained from central stations which attempt to supply larger areas. In fact, the French engineers seem to be coming to this conclusion with something approaching to unanimity."—*London Electrical Review.*

A New Wire Winder.

Persons who handle wire will appreciate the new wire winder recently patented and placed upon the market by J. Jones & Son, 67 Cortlandt street, New York, and illustrated herewith.

By loosening the thumb screw on the movable collar-holder the circumference of the reel may be enlarged or diminished, giving the coil the size desired. The frame is lacquered cast-iron and the other parts are of steel, making a most substantial machine which is indispensable to those who have used it.

A statue of Siemens and his friend Von Helmholtz, after the model of that of the Humboldt brothers in front of the Berlin University, is to be erected in Charlottenburg near the Technical High School.

THE WORLD'S RECORD FOR STEAM RAILWAY SPEED.

THE NEW YORK CENTRAL MAKES IT BY RUNNING A TRAIN 436½ MILES IN 407 MINUTES.

After quiet preparation of several weeks the New York Central & Hudson River Railroad made a world's record for speed on September 11 by running a 205-ton train from New York city to Buffalo, 436½ miles, in 407 minutes, an average rate of 64⅓ miles an hour. Electricians and others interested in the development of high-speed electric locomotives can doubtless secure valuable data from the records kept by the railway company of this wonderful run.

Last month the London & Northwestern & Caledonian Railway, of England, with a small and light train made a record of 63¼ miles an hour. It was thought that many years would elapse before this record was broken, but the deed has been done,and done, too, by a train of regular passenger cars on which people can be profitably and safely carried. The train, as it left New York, consisted of engine 870, a combination baggage and smoking car, two extra long passenger coaches and the private car "Mariquita," the whole forming a counterpart of the regular Empire State Express. Owing to the uncertain weather and the slippery rails caused by a mist, the railroad people desired to keep the trial as quiet as possible until it was accomplished. For this reason, only nine persons were invited for the trip. These included Mr. H. Walter Webb, third vice-president of the road; Mr. George H. Daniels, general passenger agent and Mr. W. J. Arkell, of *Judge*. No reporters were asked to go along.

The run was a perfect success, although 10 minutes better time might have been made with dry rails and less head wind. The speed several times reached 80 miles an hour. The following is the official record of the time made by the train:

NEW YORK TO ALBANY.

September 11, 1895.

	H.	M.	S.	
Left New York, Grand Central Station.	5	40	30	A.M.
Arrived at Albany	7	54	55	A.M.

143 miles in 134 minutes and 25 seconds.
Stopped at Albany, changing engines, one minute and 35 seconds.

ALBANY TO SYRACUSE.

	H.	M.	S.	
Left Albany	7	56	45	A.M.
Arrived at Syracuse	10	17	10	A.M.

148 miles in 140 minutes and 25 seconds.
Stopped at Syracuse, changing engines, two minutes and 25 seconds.

SYRACUSE TO EAST BUFFALO.

	H.	M.	S.	
Left Syracuse	10	19	35	A.M.
Arrived East Buffalo	12	34	57	A.M.

145¼ miles in 132 minutes and 51 seconds.
Totals, 436½ miles in 407⅝ minutes.
An average of 64¼ miles per hour.
GEORGE H. DANIELS, G. P. A.

The "Mariquita," after a half hour's stop in Buffalo, was hauled back by the Empire State Express, reaching New York at 10.15 P. M. Mr. Daniels and Mr. Arkell went to the theater, in order that it might be said that a man could leave this city in the morning, go to Buffalo, and be back in time to attend a New York theater in the evening. These two gentlemen are the only persons who ever performed such a feat.

A neat bit of journalistic enterprise was shown in connection with the record-breaking trip. The New York *Sun* heard of the proposed attempt the evening before and sent its star reporter, the best in the country, Julian Ralph, to Syracuse at nine o'clock that night. When the train reached Syracuse and while the engines were being changed, Mr. Ralph, accompanied by His Honor, the Mayor of Syracuse, strolled aboard the "Mariquita." The authority of the Mayor was recognized and Mr. Ralph finished the trip to Buffalo. The result was an excellent two-column story of the run in the next day's *Sun*.

OUR BOSTON LETTER.

The officers of the Massachusetts Street Railway Association dined at Young's Hotel on Wednesday evening last, and at the meeting it was decided that the association would be largely represented at the coming convention of the American Street Railway Association at Montreal next month. The delegates will leave Boston on a special, and Secretary Chas. S. Clark, of this city, who has charge of the matter of transportation, anticipates carrying a party of from 100 to 150 persons. The details of the trip have not yet been decided upon, but the matter is being carefully looked up and full particulars will be given in ample time for all those who intend to join the party to make the necessary arrangements. The pronounced success of the meeting in Atlanta a year ago, and the very general interest manifested in the one to be held next month, promises to make it a memorable occasion, and fully equal in point of advance to those already held, each one of which has proved more successful than its predecessor. The delegation from New England will be unusually large this year, and extensive preparations for exhibits are already under way.

The first week in the current month marked an important event in storage battery circles in this section, in the consolidation of interests of the Electric Storage Battery Company, of Philadelphia, and the Bradbury-Stone company, of Lowell. The former company have acquired all the interests of the Lowell concern, and Messrs. Bradbury and Stone are now members of the consolidated staff, with offices in the Exchange Building. They report the storage battery interests as particularly flourishing, and a steadily increasing demand for them in all branches of electrical work. H. G. T.

Boston, September 14.

Erie Telegraph and Telephone Company.

The statement of the Erie Telegraph and Telephone Company for July is as follows:

	July,1895.	July,1894.	Increase.
Gross earnings...	$90,334.64	$84,673.46	$5,661.18
Gross expenses...	44,680.83	53,367.78	Dec. 8,686.95
Net earnings...	$45,653.81	$31,305.68	$14,348.13
Increase of subscribers, 211	Dec., 87		Total, 224

	7 months, 1895.	7 months, 1894.	Increase.
Gross earnings..	$610,810.62	$589,156.82	$21,653.80
Gross expenses.	351,121.96	359,257.38	Dec. 8,135.42
Net earnings.	$259,688.66	$229,899.44	$29,779.22
Increase of subscribers, 986	Dec., 8		Total, 978

TELEPHONE NEWS AND COMMENT.

Charlottetown, Prince Edward's Island, may be connected by telephone with Vancouver, B. C.

The Erie Telegraph and Telephone Company made a net gain of 211 subscribers in July. Total number connected July 31, 17,156.

E. P. Woelk, manager of the East St. Louis Telephone Exchange, is looking into the matter of placing all wires in St. Clair and Madison, Ill., counties underground.

The Pacific Telephone and Telegraph Company is making extensive improvements in its service at Tacoma, Wash., including the establishment of two sub-stations.

The directors of the Harrison Telephone Company, of Detroit, Mich., have elected the following officers: President, Albert Pack; first vice president, Charles Flowers; second vice-president, R. A. Brett; third vice-president, C. P. Collins; treasurer, C. B. Hubbard; secretary, W. L. Holmes.

The Metropolitan Telephone and Telegraph Company, of New York city, has adopted as a standard for distributing boards a fire-proof flexible cord made to its specifications by the Western Electric Company. The fire-proof qualities are obtained by covering the wire with wool after which a treated covering is braided on.

The Memphis Telephone Company, Memphis, Tenn., has been granted a franchise in that city and has contracted with the American Electric Telephone Company, Kokomo, Ind., for the erection of a $100,000 plant. The city ordinance prohibits the Memphis company from making any deal that will prevent the erection and maintenance of the plant, nor shall the company sell or give up its franchises, nor shall it do any act or thing by which its management or control shall be turned over or consolidated with the Cumberland Telephone and Telegraph Company, or do anything to deprive the city and its citizens of the competition in telephone service. In case of the violation of any of these agreements the company shall become bound to pay to the city of Memphis, as liquidated damages, the sum of $50,000, the sum to be a lien upon the works, franchise and all property of said company. Such violation shall authorize the city to have a receiver appointed, to hold until the full amount is paid.

A feature of the Boston market has been the advance in Erie Telephone to above 64. "I am not surprised at the advance in Erie," said Treasurer Glidden to the Boston *News Bureau*. "Erie never has sold quite up to its value. The difference between Erie and New England in the market price is similar to that of an eastern railroad or bank stock paying the same rate of dividend as a western road or bank, the eastern property selling higher. The Erie company is the third largest of the Bell subcompanies, the Central Union, of Illinois and Indiana, being the largest with about 26,000 subscribers, the New England Telephone and Telegraph Company second with 23,000 subscribers and the Erie third with 17,000 subscribers. The Erie is earning 6 per cent can easily pay 5 per cent dividends, but I am not in favor of an increase at present, although it is only a matter of a short time when an increase will be quite certain."

Royalties on Invalid Patents.

Judge Bischoff, in the Court of Common Pleas at New York City on September 10, handed down a decision involving an important question in regard to the recovery of royalties on patents of the Edison General Electric Company which the United States Circuit Court is said to have declared invalid. The suit in which Judge Bischoff rendered his opinion was brought by George Maitland and the General Fixture Company against Henry P. Drew and John May. The plaintiffs sued to recover royalties due them from the defendants, who do business in this city under the firm name of Drew & May. The plaintiffs allege that on November 1, 1891, the defendants entered into an agreement with Maitland and the Edison General Electric Company, by which Maitland and the Edison General Electric Company authorized and licensed the defendants to manufacture and sell electric light fixtures, combined gas and electric light fixtures, and other electric light appliances under 26 letters patent, in consideration of paying a royalty of three per cent on all net sales. The royalties were to be paid quarterly. The plaintiffs allege that between October, 1893, and July 1, 1895, the defendants' sales amounted to $3,000 each quarter, and that there is due them $450 in royalties. Prior to the institution of the suit the plaintiffs allege that the Edison General Electric Company assigned their interest in the patents involved to the General Fixture Company. The defendants filed an answer to the plaintiffs' complaint setting up by way of defense that the patents upon which royalties were demanded had been declared invalid by the United States Circuit Court, and that the plaintiffs, for that reason, had no cause of action. The defendants also filed a counter claim for $461, which they declared to have paid to the plaintiffs upon invalid patents.

The plaintiffs demurred to this answer, and Judge Bischoff sustained the demurrer with costs. In his opinion Judge Bischoff says:

"It is well settled that a licensee of a patent under royalty contract cannot proceed to manufacture and sell the patented articles, and resist a claim for royalties upon the ground that the patents were invalid, unless he gave notice of his intention to repudiate the contract before the royalties accrued." He also held that the defendants could not recover the money paid by them.

SUBURBAN ELECTRIC RAILWAY EXTENSION IN OHIO.

GREAT RAPID TRANSIT ACTIVITY IN THE VICINITY OF CLEVELAND.

The extension of suburban electric transit from the city of Cleveland during the Summer of 1895 has far exceeded the predictions of increased mileage that were made in an article written early in the season by the writer for the ELECTRICAL REVIEW. Not less than 65 miles of track have been completed and at least 90 miles are projected. A portion of the latter may be built this Autumn but the most of it is likely to be completed next Spring.

Two lines of considerable length are well under way and almost certain to be in operation within another month. One of these lines is known as the "A, B, C" line. Unabbreviated it is the Akron, Bedford & Cleveland line. It is about 35 miles in length, in round numbers, and runs from Akron to Cleveland through one of the most fertile and one of the busiest sections of Northern Ohio. Akron is a city of about 30,000 inhabitants. Near by are several thriving suburbs and at least two of these are tapped by the new line. Between Akron and Cleveland a number of prominent towns are touched, and as all are more or less tributary to Cleveland the road is promised abundant freight and passenger transportation from the start.

This line will come into direct competition with two steam lines. It is promised that a round trip rate of $1 from Akron will prevail against the $1.40 fare asked by the steam railroad companies. This, of itself, will be sufficient to attract a large passenger transportation as there is a great deal of traveling to and from Cleveland and the towns along the line of the railroad. Bedford is a popular suburban town, lying 14 miles southeast of the city, and it is readily predicted that the electric railroad will be likely to monopolize much of the passenger traffic between the cities owing to better conveniences in the way of time and in reaching the cars of the electric railroad companies in Cleveland.

It is probable this railroad would have been in operation by the present time but for a fight between the railroad and the city officials. The Akron, Bedford & Cleveland road desires to use the tracks of the Woodland street railroad line to enter Cleveland. A new park has just been opened which is on the line of the Akron, Bedford & Cleveland. In trying to get four-cent fare the city has used this attempt to enter its precincts as a club over the heads of both roads. The railroads, however, appear to have won the victory.

It is by no means improbable that early morning trains on this new electric railroad will bring much of Cleveland's milk supply into the city. In many cases it would be much more convenient for farmers to meet the cars of the electric railroad with their milk cans than to drive farther to the stations of the steam railroads. A milk train on an electric railroad would be a novelty even in Cleveland, where the electric railroads have been pioneers in developing their opportunities.

The second great suburban line, that is sufficiently near completion to warrant the statement that it will be in operation before snow flies, is from Cleveland to Elyria, a distance of about 30 miles. This line, like that from Cleveland to Akron, traverses one of the busiest portions of northern Ohio. There is not so much manufacturing in this locality, but as Elyria is distinctly a Cleveland suburb, where many Cleveland business men have their homes, it is predicted that the passenger traffic cannot help but make the railroad pay splendidly. Several hamlets are intersected by the line, and will surely contribute greatly to the success of the road from a financial standpoint. One steam railroad comes into direct competition with the Elyria line, but as this railroad has adopted a policy of not giving to Cleveland any suburban transportation it is not expected that it will prove a very formidable rival.

A projected line, which is sadly needed by Cleveland, runs from this city to Wooster, *via* Medina. One of the most fertile farming regions in the State would thus be tapped and the railroad could pay for itself in garden truck cartage to the city. The passenger traffic would be good as well, for, although this section of the State should be directly tributary to Cleveland because of the short distance that it lies from the city, the trade has been diverted, owing to the lack of direct railroad transportation. Medina and Wooster are both county seats and neither is farther from Cleveland than 40 miles as the crow flies. The territory to be traversed is rather undulating and a few steep grades might be encountered, but the cost of building the track would not be so great as to deter projectors from putting the road through. The success of the other suburban lines encourages those who are behind this project.

A second projected line, about 40 miles in length, will extend from Cleveland southeast to Burton, in Geauga County. Here is another region that belongs to Cleveland, from a standpoint of trade, which it has always been hard to reach owing to the lack of transportation. No steam railroad from this city extends directly into this county and it is only by making a roundabout trip of something like 60 or 65 miles that the towns in Geauga County can be reached from Cleveland.

The railroad would have to depend neither upon passenger traffic nor freight traffic alone to exist, for there would be plenty of both. It would open up to the farmers of that territory the Cleveland market, which can only be reached at the present time by a tedious drive of 20 to 25 miles. To every market gardener it would be worth $100 in two years.

The third projected line is from this city to Lorain. Two years ago Lorain was merely a fair shipping point on Lake Erie some 30 miles west of Cleveland. To-day, thanks to the mammoth steel works erected by Hon. Tom L. Johnson, it is a city of over 10,000 inhabitants and growing. It depends upon Cleveland for trade facilities and the passenger traffic between these points is very great. Only one steam railroad runs between Cleveland and Lorain and its trains are few and often at inconvenient hours. During the Summer a steamboat plies between the cities, but in Winter navigation is closed. The territory which the road is to traverse is very level and the cost of construction will not be great. Lorain could be reached in almost a bee line, and as many people are of the opinion that the region between Lorain and Cleveland will be covered with dwellings and towns within the next 10 years, the construction of such a railroad seems certain to be a paying venture from the start.

The street railroads of the city have extended their lines to some extent during the Summer. The Cleveland Electric Railway Company has built a two-mile extension to a popular Summer resort on the lake, and travel has been heavy over this line throughout the season. In fact it has been so heavy that the road will doubtless be double-tracked for next Summer's travel. Suburban traffic to Rocky River over the line of the Cleveland City Railway Company has never been better than it has been this season. Summer attractions, doubtless, have done much to make the place popular.

There is every reason to believe that, when Spring opens next year, an extension of the Cleveland Electric Railway Company's line will be made to Painesville, a thriving town 30 miles east of the city. It would require the building of about 17 miles of track from the present terminus to reach Painesville. This road would traverse the handsomest region of Northern Ohio from a scenic point of view, running along the ridge that overlooks Lake Erie. It would pass through Mentor, President Garfield's old home, and would make Little Mountain, one of the most popular resorts in the State, more accessible than it is at present, when it is possible to reach the place but twice each day by Cleveland train. J. B. F.

Cleveland, O., September 13.

"The Best on the List."

To the Editor of ELECTRICAL REVIEW:

We have the ELECTRICAL REVIEW along with all the other electrical journals on the desk. I consider the REVIEW the best electrical paper on our list. W. O. HUNT.

Adrian, Mich., September 10, 1895.

Lightning struck the back part of car 106 of the Nassau Electric Railroad of Brooklyn, N. Y., one evening last week, near the Kings county penitentiary. For fully half a minute the 35 passengers were paralyzed.

DEATH OF HENRY BENTLEY.

"FATHER OF THE LOCAL TELEGRAPH."

Henry Bentley, of Germantown, Philadelphia, Pa., who was known as the "father of the local telegraph," died of heart trouble on September 7 at Stanford Heights near Rhinebeck, N. Y., where he had been spending the Summer. He was born in Dutchess County, New York, in 1834 and when 20 years old came to New York, where he secured a position as a writer on the *Tribune*, besides keeping the books of a coffee and spice house. He got into the electrical business, which occupied so much of his attention afterward, by becoming connected with J. B. Richards, a skilled mechanic, who was perfecting Royal E. House's printing telegraph instruments.

Mr. Bentley assisted in organizing a company which was known as the New York City and Suburban Printing Telegraph Company, and of which he was made the general manager, this position including also the duties of constructor, repairer, batteryman and cashier. The company opened offices for the transmission of messages at the rate of 10 words for 10 cents, but did not succeed. Then Mr. Bentley proposed to the capitalists who were in the concern that they lease the lines to him for 25 per cent of the proceeds, and they accepted. He opened offices in various hotels and other places and soon began to make money rapidly. He laid a cable to Brooklyn, which no one had successfully done, and thus added a large and profitable business to what he already had. The success of this enterprise, it is considered, made him the father of the local telegraph business.

HENRY BENTLEY.

Shortly before the war he again took up local telegraphy and built several private lines in Philadelphia, which were subsequently amalgamated under the management of the Philadelphia Local Telegraph Company, capitalized at $400,000, with Mr. Bentley as president. He organized a service for bankers and brokers and a local news service, which was maintained for many years. A branch of the local service was organized under the name of the Gold and Stock Reporting Telegraph Company. Of this company Mr. Bentley was also the president. He was identified with the management of all the Western Union Telegraph Company's subordinate companies. Mr. Bentley helped to organize the Bell Telephone Company, of Philadelphia, and for eight years was its president. When he resigned he was succeeded by James B. Merrihew. He was a friend of Thomas A. Edison in the early days of his electrical work.

The marriage of H. Ward Leonard, of New York city, to Carolyn M. Good at Geneva, Switzerland, on August 24 is announced.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

ANN ARBOR, MICH.—The Michigan Electric Company, of Detroit, has been given the contract of lighting this city for the ensuing year.

NIAGARA FALLS, N. Y.—The Falls Electric Power Land Company has been incorporated. Capital, $150,000. Directors, J. C. Morgan and Richard F. Rankine, of Niagara Falls; Commodore P. Vedder, of Ellicottville; Jerome B. Fisher, of Jamestown, and George H. Johnson, of Niagara Falls, Ontario.

MERIDIAN, MISS.—F. B. Merrill has been awarded contract for lighting the city with electricity.

NORFOLK, VA.—W. R. Brown and J. A. Helvin have obtained electric light franchise.

KANSAS CITY, MO.—The American Incandescent Gas Company, incorporated by A. E. Stilwell, George M. Meyers, E. L. Martin and others, to manufacture gas and electric light appliances. Capital stock, $1,000,000.

GEORGETOWN, MASS.—Steps are being taken to establish an electric light plant.

BETHEL, VT.—A stock company has been organized to own and operate an electric light plant.

WINDSOR, CONN.—The Hartford Light and Power Company will probably put in electric lights at Windsor.

CLAREMONT, N. H.—Steps are being taken to establish an electric light plant.

NORTHAMPTON, MASS.—L. J. Hutchinson is now in charge of the Northampton electric light plant, and he will make some important improvements.

LEXINGTON, MO.—The Western Electric Company, of Chicago, has been awarded contract for the erection of an electric light plant in Lexington.

YOUNGSTOWN, OHIO.—H. F. Kearscher has applied for franchise to construct an electric plant.

HILLSDALE, ILL.—Hillsdale Electric Light Works, incorporated by Henry L. Gardner and Arthur Morgan. Capital stock, $5,000.

KANSAS CITY, KAS.—R. B. Armstrong and J. B. Robinson have asked permission to build a plant and furnish electricity for lighting and mechanical purposes.

KANSAS CITY, KAS.—John P. Loomis has asked for franchise to establish an electric light plant.

BROOKFIELD, MO.—The franchises for electric and gas lights and telephone system have been sold. The franchises are for 20 years and the purchaser is to pay one-half of one per cent of the gross income of the plants for the first 15 years and two per cent for the following five years.

SWEET SPRINGS, MO.—Steps are being taken to establish an electric light plant.

PHILADELPHIA, PA.—The Acetylene Light, Heat and Power Company has been incorporated with a capital stock of $1,000,000.

LEADVILLE, COLO.—Salt Lake Citizens' Electric Light Company, incorporated by Charles Boettcher, John F. Campion and George W. Trimble, with a capital stock of $500,000.

DUBLIN, GA.—James B. Sanders, Mayor, may be addressed concerning the establishment of an electric light plant.

DES MOINES, IOWA.—The Great Western Light and Heating Company, incorporated by A. E. Johnson, E. P. Thompson and E. W. Benedict. Capital stock, $250,000.

MENDOTA, ILL.—The Mendota Electric Light Company certified to a consolidation with the Mendota Light and Heat Company.

JACKSONVILLE, FLA.—The Bay street electric light plant is now furnishing lights for commercial purposes.

SPRINGFIELD, MASS.—The United Electric Light Company has completed plans for an additional plant at Indian Orchard whereby an increase in electric motive and lighting power may be obtained.

HOUSATONIC, MASS.—It is said this village will soon be lighted by electricity from the Great Barrington plant.

CANTON, MISS.—A contract for putting in waterworks and electric light plant, at a cost of $35,100, has been let to the Southern Electric Supply Company, of New Orleans. The plant will be owned by the city.

RUSH CITY, MINN.—Dr. A. J. Stowe, W. Wadlow and C. F. Jackson have been granted an electric light franchise for 30 years.

New Electric Railways.

NEWBURYPORT, MASS.—The movement to secure sufficient capital to manufacture street cars in this city has been very successful, and a meeting of the subscribers will be held very soon to complete the organization of the company. The old name Newburyport Car Manufacturing Company will be retained.

RICHMOND, IND.—An electric railway, to cost $10,000 per mile, is to be built shortly.

NEW BRITAIN, CONN.—The Central Railway and Electric Company will extend its line towards Hartford.

SPOKANE, WASH.—J. F. Baker, of Chelan, will build an electric road to run between the foot of the lake and the Columbia River at Chelan Falls.

DAYTON, OHIO.—An electric line is to be constructed to connect Dayton and Cincinnati.

LANSING, MICH.—Lansing Street Railway Company has been sold to Maj. L. N. Downs, of New York; F. N. Rowley, of Kalamazoo; and E. E. Downs, of Battle Creek. The road will be greatly improved.

SOUTH FRAMINGHAM, MASS.—The franchise has been granted for an electric road from this place to Holliston.

NEVADA, MO.—The Nevada Electric line will probably be extended to Eldorado.

BRYAN, OHIO.—The Bryan, Hicksville, Maysville & Fort Wayne Electric Railroad has been incorporated by P. A. Randall, Stephen A. Heath and others, for the purpose of building an electric railroad to connect Bryan with the towns named. Capital stock, $200,000.

RICHMOND, IND.—Theo. McClellan and others are interested in the construction of an electric railroad from this city to Connersville. Subscriptions are now being raised for that purpose.

PUEBLO, COLO.—Pueblo Electric Street Railway Company, incorporated by A. D. Pattison, Elmer E. Whitted, Anthony C. Bell, Irving Hall and others. Capital stock, $500,000.

KINGSTON, N. Y.—Ulster County Electric Railroad Company has been incorporated to construct street surface railroad, to be operated by electricity, about seven miles in length, in Kingston. Capital, $100,000. Directors, Charles A. Johnson, Frederic H. Reed, George N. McKibbin, William C. Orton, Robert McA. Lloyd, Charles M. Nicholls, Raymond C. Johnson and Harry C. Evans, of New York city, and William T. Tiers, of Philadelphia, Pa.

TROY, N. Y.—The contract for building a 1,000 horse-power engine for the Division street power station of the Troy City Railway Company was awarded to Knowlson & Kelley.

HALIFAX, N. S.—The street railway has been sold by the sheriff for $25,000 to the electric railway company.

NEW YORK, N. Y.—It is reported that the Third Avenue Railroad Company will abandon the cable and substitute the underground electric system before 1897.

NEW ORLEANS, LA.—The Chalmette Railway Company has been organized with Henry T. Beauregard, president; R. C. Ducross, vice-president, and J. D. Alexander, secretary. Capital stock, $100,000.

BENNINGTON, VT.—Twenty-five thousand dollars has been subscribed for the construction of the Bennington street electric railway.

PITTSBURGH, PA.—There is a movement on foot providing for the consolidation of all the street railways in Pittsburgh. If carried through over 200 miles of street railways will be under one management, and will involve a capitalization of about $25,000,000.

CANTON, OHIO.—The Canton & Wooster Railway Company will build an electric line between Massillon and Canton.

NORWALK, OHIO.—The Sandusky, Milan and Norwalk electric railways are to have a change of ownership in about 10 days.

New Telephone and Telegraph Companies.

PADUCAH, KY.—There is a scheme on foot to establish a new telephone line here.

SUMMIT HILL, PA.—A new telephone company has been organized here in opposition to the Pennsylvania Telephone Company. Its promoters are Dr. T. W. Renshaw and William and Joseph Schneider, of Summit Hill, and Dr. E. H. Kistler, James W. Maloy and D. A. L. Davis, of Lansford. The line will be built by the Reading Electrical Construction Company.

INDIANAPOLIS, IND.—The Pana Telephone Company proposes to build exchanges at Anderson, Tipton, Kokoma, Logansport, Summitville and Alexandria, connecting them with Elwood.

WAUKON, IOWA.—The Standard Telephone Company, incorporated with B. H. Stevens, president; Herman Boeckeh, vice-president, and J. J. Dunleavy, secretary. Capital stock, $25,000.

BUTTE CITY, MONT.—The Rocky Mountain Bell Telephone Company has purchased the line of the Great Falls & Lewistown company and will at once proceed to make many improvements.

FORT FAIRFIELD, ME.—The White Mountain Telephone Company will commence the construction of a line from this place to Limestone.

VOSSBURG, MISS.—Capt. C. W. Gallagher, of Meridian, representing the Standard Telephone, closed a contract yesterday with some of the leading citizens of Vossburg and Paulding to build a telephone line from this place to Paulding, and will begin work on it in a few days.

HOT SPRINGS, ARK.—A new telephone system is to be established here.

ST. JOHNS, MICH.—The business men of this place are endeavoring to secure enough subscribers to start a city telephone exchange.

SCHOOLCRAFT, MICH.—The Southern Michigan Telephone Company has a franchise and will put in instruments here.

ROME, GA.—A new telephone line has been projected from Center, the county seat of Cherokee County, Alabama, to Gadsden, about 25 or 30 miles away.

New Manufacturing Companies.

ST. LOUIS, MO.—The International Electric Company, incorporated by J. M. Davey, St. Louis; George DeLisle, St. Charles; H. B. Russell, H. E. Chandler and H. G. Ferguson, St. Louis, for the purpose of manufacturing incandescent lamps. Capital stock, $15,000.

ELMIRA, N. Y.—Elmira Safety Appliance Company, incorporated by Charles Langdon, George M. Divan and W. N. Estabrook, to manufacture electrical engine stops, etc. Capital stock, $5,000.

NEWARK, N. J.—Newark Electric Developing Company, incorporated by Charles A. Demarest, Eugene Eagles, Charles H. Madison and James H. Reinhardt, to manufacture magnetizing boxes, etc. Capital stock, $100,000.

NEW YORK, N. Y.—Manhattan General Construction Company, incorporated by Charles D. Hill, Benjamin J. Gould, Jr., and others, to manufacture electrical appliances. Capital stock, $100,000.

Increase of Capital Stock.

ELMHURST, ILL.—Elmhurst Electric Light and Power Company has increased its capital stock to $30,000.

CORTLAND, N. Y.—Cortland Electric Forging Company has increased its capital stock to $100,000. The following directors have been elected since the company reorganized: Messrs. D. F. Wallace, Curtis L. Kinney, Benjamin F. Taylor, Enos E. Mellon and J. Hub Wallace.

LONG ISLAND, L. I.—The Electric Illuminating and Power Company has increased its capital stock from $50,000 to $150,000.

BROOKLYN, N. Y.—The Municipal Electric Light Company has increased its capital stock from $500,000 to $1,000,000.

Electric Locomotives To Be Tested in Peru.

It was reported last week that a representative from the Baldwin Locomotive Works, with an expert electrician from the Westinghouse company, together with Sir Henry Tyler, ex-president of the Grand Trunk Railway, would depart for Peru, where it is said a test of the possibility and feasibility of the electric locomotive is to be made upon a railroad 15,000 feet above the sea level. Sir Henry Tyler was in Philadelphia for several days in conference with members of the Baldwin firm, and it was decided to make the experiment.

Niagara Falls Power Company Refuses the Buffalo Franchise.

The Niagara Falls Power Company has refused to accept in its present form the proposed franchise recommended by the joint committee of the boards of councilmen and aldermen of Buffalo, N. Y. In the letter of declination Secretary Rankine suggests certain changes which the company think ought to be made.

The *Inland Printer* for September contains some especially striking illustrations, notably the frontispiece in half-tone tints by J. C. Leyendecker. The cover design by C. Ottman is highly artistic and the half-tone engravings scattered through the pages are excellent.

The Tesla Multiphase System.

Mr. Lemuel Bannister, vice-president and general manager of the Westinghouse Electric and Manufacturing Company, of Pittsburgh, is sending the following letter to central stations throughout the country:

In view of the great prominence given to the multiphase motors covered by the patents of Mr. Nikola Tesla, we think it right to direct your attention to the fact that this company claims the exclusive right to manufacture and sell all forms of motors operated by currents of two, three or more phases, and all forms of single-phase motors where a second phase is induced so as to make the same a two-phase induction motor, notably the form used for the operation of fans. Suits are now pending against the Thomson Houston Electric Company (the General Electric Company), the Stanley Manufacturing Company, of Pittsfield, Mass., and numerous suits have been entered against the users of apparatus purchased from the above companies; it being the intention of this company to enforce its exclusive right to manufacture and sell multiphase generators and motors, the two being used in combination as a system, and such system being covered by the patents of Nikola Tesla above referred to. In the first named suits, the General Electric Company has put in its defense, and the court has limited it to October 7, 1895, in which to complete its testimony, so that a hearing may be had in the latter part of this year or the beginning of 1896. We are advised that the defense has been unable to produce a single working device that can in any way take from Mr. Tesla the pioneer character of his inventions.

We have been informed that the two companies named have offered to guarantee the purchaser of infringing apparatus against damage or loss, but you can well appreciate that it will be impossible for such companies to make good their guarantees to cover *all* losses if the courts enjoin the use of apparatus made in imitation of that covered by Tesla's patents.

We are prepared to furnish multiphase generators and motors for all classes of work, and being the owners of the patents, no contingency can arise by which the purchasers of such apparatus made by us can in any way be interfered with in its continued commercial use.

It is the opinion of those who have given the subject most careful attention, that in the near future a very large proportion of the electric work will be done by the multiphase system, and this, together with the fact that in the main, we believe, men would prefer to purchase property from its rightful owners, has led us to write to you and give you an opportunity to place your orders with this company for such multiphase apparatus as you may desire to use, and thus avoid the risks incident to the purchase of apparatus from unlawful manufacturers.

The adoption by the General Electric Company of the term "Monocyclic" in connection with their use of multiphase apparatus, does not free them from the charge of infringement, but on the contrary makes the case against them stronger, because of the sale of apparatus under misleading terms.

In conclusion we wish to call your attention to the fact that with our system incandescent lights, arc lamps and alternating motors can be operated from the same circuits, and that it will be of especial advantage to companies desiring to remodel or to increase their plants to make a full and careful investigation of the Tesla apparatus as installed in our works at East Pittsburgh, and you are invited to come or send a representative, to whom every facility will be given for careful inspection.

The Baltimore Electric Locomotive.

The first high-speed trial of the Baltimore & Ohio Railroad Company's electric locomotive took place in the Belt Line tunnel at Baltimore on September 6. The trial developed a speed of 61 miles an hour on the heavy grade of the tunnel, and the engineers said it was equivalent to 75 miles an hour on a level track. The performance of the locomotive was such that they would not hesitate to run it at that, or even a greater speed, if they had a sufficient stretch of track for the purpose. This locomotive was not designed for fast time, and the result of its latest test is looked upon as an indication of what may be expected from an electric locomotive specially designed for such a purpose. Since August 4 the locomotive has been hauling the entire freight service of the Baltimore & Ohio through the tunnel, and it has been daily ready for operation every hour of the 24. The average speed maintained in hauling heavy freights has been 15 miles an hour.

The British Association.

The sixty-fifth annual meeting of the British Association for the Advancement of Science opened on September 11 at Ipswich, England. Lord Kelvin introduced the new president, Sir Douglas Galton, who started in to read a long address. After reading three-quarters of the address Sir Douglas fainted. He soon recovered, but Sir John Evans read the rest of the address. Among those present were Professor Ira Remsen of Johns Hopkins University, Baltimore, and Dr. Frederick Bedell of Cornell University.

Telegraphers are alarmingly subject to consumption, according to the *British Medical Journal*. Out of 100 deaths among all adult males in England, 13.8 are due to consumption; out of 100 deaths among the grinders in the cutlery trade who are specially subject to the disease, 33.1 are due to it, while the proportion for the telegraph operators is 46.6 in 100. More than half of them die of diseases of the respiratory organs, against 24 per cent only in all other occupations.

H. C. Bunner, the editor of *Puck*, has written for the October *Scribner* an account of the rise and development of the poster habit in America, with a very amusing series of illustrations.

AN ELECTRICAL EXHIBITION ASSURED.

TO BE HELD DURING THE NEXT MEETING OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION IN NEW YORK CITY.

At a meeting of the Executive Committee of the National Electric Light Association, held at the Murray Hill Hotel, New York city, on the evening of September 10, it was practically decided to hold an electrical exhibition during the convention of the association in New York city in May, 1896.

The following members of the committee were present: C. H. Wilmerding, president; E. F. Peck, vice-president; C. O. Baker, Jr., master of transportation; Charles R. Huntley, E. H. Davis, A. Markle, W. R. Gardener, G. A. Redman, J. J. Burleigh and John A. Seely.

A committee, composed of John A. Seely, chairman; E. F. Peck, secretary, and A. J. De Camp, was appointed to consider the matter of holding an electrical exhibition in connection with the nineteenth convention of the association to be held in May, 1896, in New York. This committee was clothed with power to act and will report as soon as possible to the full board. The committee is ready to receive propositions regarding the exhibition and is understood to be already considering one offer which guarantees the association against loss and allows it to participate in any profits. This is in consideration of the association allowing the exhibition to be held under its auspices.

The electrical trade seems to be in favor of an exhibition of this kind. In answer to inquiries on the subject, the Executive Committee received 45 letters, 30 of which were in favor of an exhibition. If the proper people are secured to manage the affair, and if the association can be guaranteed against loss by bonds, or otherwise, it would seem that it might be a good thing for the association and also advance the general development of electrical science and industry.

SPECIAL ANNOUNCEMENT.

The demand for good men in the many branches of electrical work is again noticeable.

The ELECTRICAL REVIEW desires to aid all who are out of employment in this field, and will publish from now until October 1 all announcements of "Positions Wanted" at *one-third* the regular rate.

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ELECTRICAL PATENTS

ISSUED SEPTEMBER 10, 1895.

545,870 Electric railway switch; R. A. Baldwin, South Norwalk, Conn.

545,903 Electric signaling apparatus. 545,904 Electric signaling; G. E. Miller, Boston, Mass.

545,921 Telephone exchange system; A. Stromberg, Chicago, Ill.

545,922 Telephone apparatus; A. Stromberg, Boston, Mass.—A microphone transmitter, a rotatable shaft upon which said transmitter is mounted, a hook for the telephone receiver provided upon the said shaft, and contact points forming the terminals of the local transmitter circuit adapted to be controlled by the rotation of said shaft.

545,938 Telegraph receiver; O. P. Briggs, Chicago, Ill.—A lever adapted to be vibrated, a punch adapted to be operated by said lever, and a die adapted to be brought in engagement with said punch upon the transmission of each signal.

545,976 Manufacture of electric or other conduits; E. L. Ransome, Chicago, Ill.—Consists in packing concrete into the spaces between a group of cores, in giving said cores a rotary movement, the quality of which is that adjacent core surfaces move in opposite directions and simultaneously with such rotary movement, causing the said cores to advance axially along the trench in which the monolithic structure is being formed.

546,002 Electric drill; C. S. Bradley, Avon, N. Y.—A series of coils grouped to develop a series of consequent poles along their axis and connected with a differential phase circuit to produce a progressive movement of the poles with a plunger surrounded by a series of closed bands or circuits in inductive relation to the coils, said closed bands or circuits being unsymmetrically spaced with reference to the coils.

546,005 Flexible conductor and inclosed conduit therefor; L. Dion, Natick, Mass.

546,016 Electric alarm clock; W. Kist, Hoboken, N. J.—By means of a rod normally resting on the winding key of clock and electrical connections with a plate, the rod and a battery an alarm is sounded.

546,027 Telephone; E. C. Parker, London, Eng.—A vibrating diaphragm, a rotatable carbon holder carried in bearings thereon and carbon in said holder.

546,036 Signal box; N. S. Surem, New York, N. Y.—A cut-out switch, having a pawl with beveled end for engaging the wheel movement, a stationary beveled pin moving the pawl out of engagement with the wheel movement when the latter is running.

546,037 Signal box; N. S. Surem, New York, N. Y.

546,059 Electric railway; W. M. Schlesinger, Philadelphia, Pa.

546,120 Electric brake; W. Koedding, St. Louis, Mo.—Has a coil or series of coils, fixed within a stationary metallic cylinder, and around an internal core, a coil around the internal core of a second cylinder and moving within the first cylinder, the core facing end of the stationary coil being preferably cone shaped, and the corresponding core facing end of the movable coil funnel shaped.

546,130 Closed conduit electric railway; J. M. Deal, Fernwood, Pa.—A conduit, comprising a trough, two converging side plates thereon, and a longitudinally disposed bar of conducting metal fastened to and between the converging edges of said plates.

546,143 Electric railway system; H. A. Fry, Portland, Oregon.—A slot rail having a horizontal flange, a vertical pendent slot flange and an inclined outer flange joining on to the horizontal surface flange, and forming a housing or inclosure for an electric conductor.

546,190 Regulator for alternating current dynamos; E. W. Rice, Jr., Lynn, Mass.—A field magnet produced by two independent sources, one practically constant and the other variable, a branch having practically no self-induction around the coil forming the variable source, and means for varying the resistance in said branch.

546,191 Electric locomotive; E. W. Rice, Jr., Lynn, Mass.—A prime mover, a generator and transformer, both separately excited, with an alternating current motor on the trucks of said locomotive, and means for regulating by varying the field strength of the generator.

546,220 Art of manufacturing electromagnets; H. P. Brown, New York, N. Y.

546,228 Signal transmitter; W. H. Davis, Como, Colo.—A helical cam, a toe thereon, a lever actuated by the cam, a second lever connected to the first lever and actuated by the toe, a drum, a contact arm, and electrical connections.

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